

**Definite Project Report-Environmental Assessment  
Mad River  
Woodtick Area  
Waterbury, Connecticut**

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# **Local Flood Protection**

**OCTOBER 1987**



**US Army Corps  
of Engineers**  
New England Division

**LOCAL FLOOD PROTECTION  
MAD RIVER  
WATERBURY (WOODTICK AREA), CONNECTICUT**

**DEFINITE PROJECT REPORT  
FOR  
WATER RESOURCES DEVELOPMENT**

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION - CORPS OF ENGINEERS  
October 1987

## **SYLLABUS**

This study is authorized under the special continuing authority contained in Section 205 of the 1948 Flood Control Act, and investigates a variety of flood control alternatives to reduce recurring flood damages along the Mad River in the Woodtick area of Waterbury, Connecticut. It was initiated at the request of the former Mayor of Waterbury, Edward D. Bergin.

Flooding of the Mad River, Connecticut, is a problem resulting from past flood plain development and high runoff from major storms and snowmelt. Extensive development and filling of the flood plain in the Woodtick area has occurred during the last decade.

Flooding occurred most recently in June 1982, when an intense storm rainfall caused the Mad River to overflow its banks, inundating private residences, apartment and condominium units, light industrial enterprises and a commercial building. Total flood losses attributable to the June 1982 flood in this area are estimated at over \$2.6 million. The frequency of this event was estimated at about once in 50 years.

This study describes the plan formulation process which involves the development and evaluation of possible flood protection alternatives. Each alternative was assessed in terms of its effectiveness, efficiency, completeness and acceptability to the public. The selected plan is composed of widening the Mad River channel along two restricted sections in the vicinity of Bouffard Avenue and Frost Road at an estimated first cost of \$1,055,000 and an annual cost of \$99,500. This plan, while not eliminating the flood problem, would reduce estimated annual flood losses by 64 percent, with most residual flooding limited to shallow (less than 1/2-foot deep) street and parking lot flooding. Total average annual benefits are estimated at \$150,000. The project is justified with a benefit-cost ratio of 1.5 to 1.

It is recommended that, subject to certain conditions of local cooperation as outlined in this report, the proposed plan be constructed. The estimated share of first cost to the United States and to the local interests are based on cost sharing arrangements described in detail in Section V of the report. The annual operation and maintenance costs, estimated at \$2,000, are a non-Federal responsibility.

# MAIN REPORT

## TABLE OF CONTENTS

	<u>PAGE NO.</u>
<b>I. INTRODUCTION</b>	
Study Authority	1
Study Process and Report	1
Study Area	2
Prior Reports	2
Existing Projects	2
<b>II. EXISTING CONDITIONS</b>	
Economic and Social Conditions	3
Land Use	5
Basin Description	5
Climatology	6
Streamflow	6
Flood History	6
Hydropower	7
Environmental Setting	7
<b>III. PROBLEM IDENTIFICATION</b>	
Without Project Conditions	10
Problems and Opportunities	11
Problem and Opportunity Statements	12
Planning Constraints	12



## **TABLE OF CONTENTS**

(cont'd)

### **IV. PLAN FORMULATION**

The Federal Objective	13
Plans of Others	13
Flood Protection Measures	14
Plan Formulation Rationale	14
Comparison of Alternatives	19
Conclusion	19

### **V. SELECTED PLAN**

Description	20
Costs	21
Project Operation	22
Plan Accomplishments	23
Project Effects	24
Economic Evaluation	28
Cost Apportionment	29

### **VI. PLAN IMPLEMENTATION**

### **VII. SUMMARY OF PUBLIC COORDINATION**

### **VIII. CONCLUSION**

### **IX. RECOMMENDATIONS**

### **X. ACKNOWLEDGMENTS**

### **XI. ENVIRONMENTAL ASSESSMENT**

### **APPENDICES**

1. Hydrologic Analysis
2. Economic and Social Analysis
3. Geotechnical Studies
4. Real Estate
5. Public Involvement

## **TABLE OF CONTENTS**

(cont'd)

### **LIST OF TABLES**

<b><u>TABLE NO.</u></b>		<b><u>PAGE</u></b>
1.	EMPLOYMENT BY INDUSTRY	4
2.	HISTORICAL PEAK DISCHARGES	7
3.	ALTERNATIVE FLOOD PROTECTION MEASURES	14
4.	FLOODPRONE STRUCTURES, WOODTICK AREA	17
5.	COMPARISON OF ALTERNATIVES	19
6.	FIRST COSTS OF SELECTED PLAN	22
7.	EFFECTS OF SELECTED PLAN ON NATIONAL RESOURCES	26
8.	ESTIMATED ANNUAL COST OF SELECTED PLAN	28
9.	ECONOMIC ANALYSIS OF SELECTED PLAN	28
10.	PROJECT COST SHARING - SELECTED PLAN	29

### **LIST OF PLATES**

<b><u>PLATE</u></b>	
1.	VICINITY MAP
2.	MAD RIVER BASIN MAP
3.	MAD RIVER FLOOD PLAINS
4.	MAD RIVER RELIEF SEWER INTERCEPTOR
5.	GENERAL PLAN AND SECTIONS
6.	GENERAL PLAN AND SECTIONS

# **I. INTRODUCTION**

## **STUDY AUTHORITY**

This report has been prepared under the special continuing authority contained in Section 205 of the 1948 Flood Control Act, as amended, which states:

"The Secretary of the Army is authorized to allot from any appropriations heretofore or hereafter made for flood control for the construction of small projects of flood control and related purposes not specifically authorized by Congress, which come within the provisions of Section 1 of the Flood Control Act of June 22, 1936, when in the opinion of the Chief of Engineers such work is advisable. The amount allotted for a project shall be sufficient to complete Federal participation in the project. Not more than \$5,000,000 shall be allotted under this section for a project at any single locality. The provisions of local cooperation specified in Section 3 of the Flood Control Act of June 22, 1936, as amended, shall apply. The work shall be complete in itself and not commit the United States to any additional improvement to insure its successful operation, except as may result from the normal procedure applying to projects authorized after submissions of preliminary examination and survey reports."

This study was initiated at the request of the former Mayor of Waterbury, Edward D. Bergin on October 20, 1983.

## **STUDY PROCESS AND REPORT**

The Corps of Engineers has prepared this report to document its investigation of flooding conditions along the Mad River in the Woodtick area which have been aggravated by development in the flood plain and the accumulation of debris and silt in the Mad River channel. The primary objectives of this investigation are to identify the water resource problems and opportunities of the study area, formulate potential measures to address these issues, evaluate measures, and recommend the most cost effective way to reduce the risk and severity of future flood losses. This report has been prepared in accordance with existing administrative and legislative water resources policies, guidelines, and authorities pertinent to the Civil Works activities of the Corps of Engineers.

The study process was directed to meet Federal and Corps guidelines, reflect concerns of citizens, address problems and opportunities of the area, meet the requirements of the National Environmental Policy Act (NEPA), maintain coordination with other agencies and encourage and obtain public participation.

This Definite Project Report presents the results of the feasibility study, an environmental assessment and technical appendices.

## **STUDY AREA**

The city of Waterbury is located in west-central Connecticut, about 20 miles north of New Haven, Connecticut and about 25 miles southwest of Hartford, Connecticut. The principal problem area is located about 3 miles upstream from the mouth of the Mad River between Sharon and Frost Road Bridges (see Plate 1). This section of Waterbury is referred to as the Woodtick area and consists primarily of residential development, including several apartment and condominium complexes. There are also some light manufacturing companies and a large retail shopping mall in this reach.

## **PRIOR REPORTS**

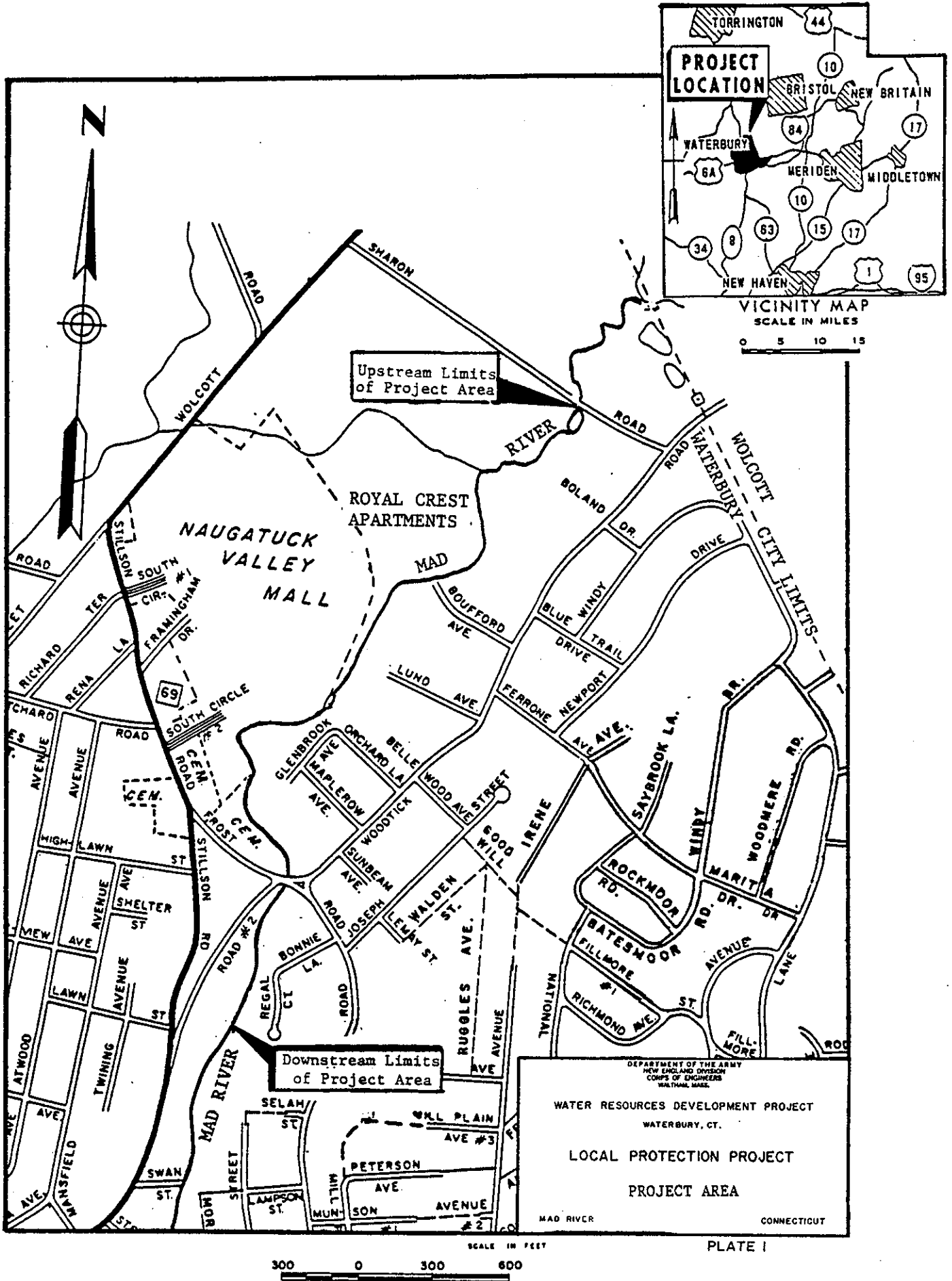
### Flood Insurance Study

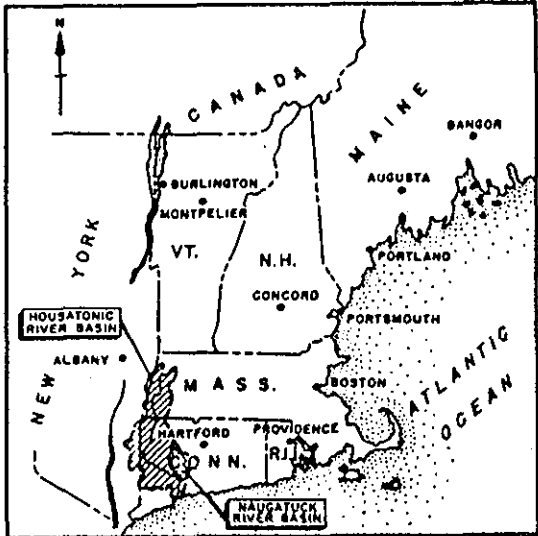
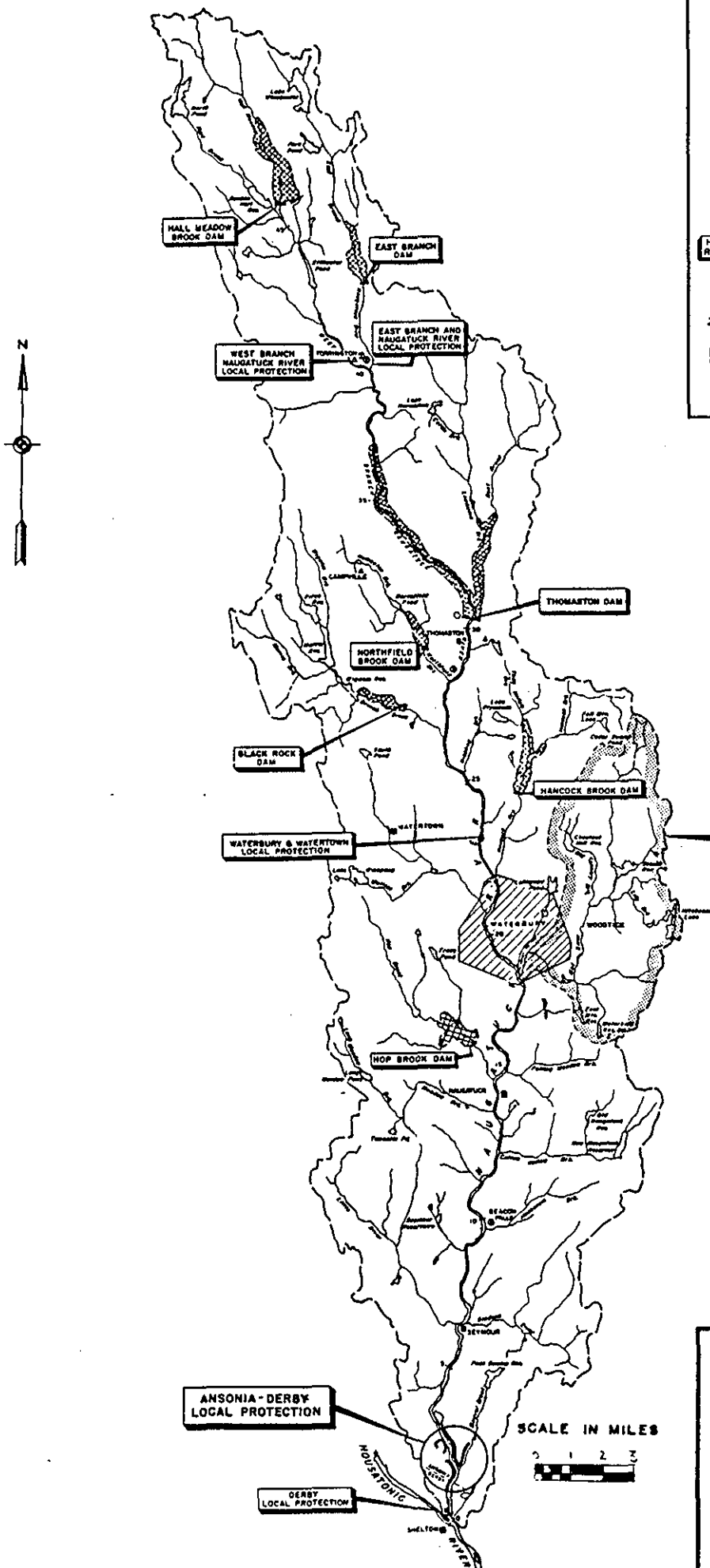
The Federal Emergency Management Agency (FEMA) completed a Flood Insurance Study in the city of Waterbury in November 1977. The results of the study were used for the regular phase of the flood insurance program, which the city joined on 1 November 1979.

## **EXISTING PROJECTS**

There are no Federally constructed flood control projects within the Mad River Basin. As shown on Plate 2, there are completed Federal projects in the Naugatuck River Basin, but they do not provide any flood protection for the Mad River Basin.

In 1974 extensive channel modifications were constructed in the Woodtick area between Bouffard Avenue and Sharon Road Bridge by the Flatley Corporation for the Royal Crest Estates apartment complex. Prior to 1974 this reach of the river contained several small meanders and varied between 20 to 40 feet in width. Modifications consisted of limited channel straightening and widening to 50 feet. This work, however, failed to protect the apartment complex from subsequent flooding during June 1982.





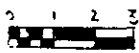
LOCATION MAP

SCALE IN MILES  
0 40 80

LEGEND

- COMPLETED FLOOD CONTROL PROJECT
- U. S. GEOLOGICAL SURVEY GAGING STATION
- CITIES
- FLOOD CONTROL DAM SITES

SCALE IN MILES



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT  
WATERBURY, CT.

NAUGATUCK RIVER WATERSHED  
MAP

MAD RIVER CONNECTICUT

## II. EXISTING CONDITIONS

### ECONOMIC AND SOCIAL CONDITIONS

Waterbury is one of the thirteen communities that make up the Central Naugatuck Valley Region (CNVR).

#### Economy

Waterbury's economic history parallels many other small industrial "river" cities in New England. The Naugatuck River runs through the center of the city creating a valley from which sharp and rocky hills rise on either side of the river. This rocky terrain made Waterbury an unsuitable candidate for farming and, therefore, encouraged the development of small industry earlier than in many New England cities.

Waterbury developed into an important industrial center by the late 1700's, producing silver, tinware, brass buttons and lamps. By the mid 1800's, the city expanded its manufacturing capacity through the widespread mill system and became one of the world's largest producers of fabricated metal: metal alloys and precision metal parts.

During the 1960's and early 1970's, as manufacturing began to decline, Waterbury became one of the more economically depressed regions in the State. Between 1970 and 1984, Waterbury lost approximately one-third of its heavy manufacturing jobs. In 1970, just under 50 percent of nonfarm workers were employed by manufacturing firms. By 1984, the percentage had dropped to 34 percent. Most of these job losses were high paying factory jobs which contributed greatly to the local economy. The city is now classified as a "labor surplus area" which means that its relatively high unemployment status qualifies the area for preference in bidding on Government contracts.

Within the last few years, Waterbury has made substantial economic progress through the use of urban rehabilitation funds together with efforts by city government to attract a diversity of light manufacturing and land developers. Waterbury had been, until recently, a one-industry city highly vulnerable to plant closing and business cycles. Table 1 indicates the current diversity of employment in Waterbury.

**TABLE 1**  
**EMPLOYMENT BY INDUSTRY (1980)**  
**WATERBURY, CONNECTICUT**

<u>PERCENT</u>		<u>EMPLOYED</u>
0.40	Agriculture	172
1.30	Communications	598
2.90	Construction	1,331
4.20	Finance, Insurance & Real Estate	1,927
40.60	Manufacturing	18,410
0.01	Mining	8
4.70	Public Administration	2,149
14.00	Retail Trade	6,364
24.70	Services	11,226
2.50	Transportation	1,112
1.10	Utilities & Sanitary Services	513
3.50	Wholesale Trade	1,576
<u>100.00%</u>	<b>TOTAL</b>	<u>45,386</u>

### Population

Waterbury is the fourth largest city in the state with an estimated 1985 population of 102,000. The city, however, has experienced a 5.5 percent decline in population since 1970. This decline has resulted from an outward migration of city residents to the neighboring suburbs.

Since 1960, the Central Naugatuck Valley Region has experienced population growth at a rate of 24.7 percent.

The overall growth of the region and the out migration from neighboring Waterbury is apparent when examining the rapid growth of neighboring suburban towns. For example, Southbury grew at an incredible rate of 80.3 percent between 1970 and 1980 while Oxford grew 48.1 percent during the same decade. Both towns are continuing to grow but at much less rapid rates during the 1980's. Population figures for the Central Naugatuck Valley Region are presented in the Economic and Social Analysis Appendix.



Population losses have encouraged Waterbury to change some of its zoning regulations to extend development to the suburban edges of the city. Multi-family dwellings, particularly condominiums, have become a popular alternative to either inner city housing or more costly suburban housing in surrounding communities. This strategy has been somewhat effective in bringing population back within city limits. At present, however, there is a growing movement to place a moratorium on condominium construction mainly because of inadequate traffic access to and from the newly developed areas.

## **LAND USE**

Land use data for Waterbury and the town of Wolcott to the northeast was obtained from the Central Naugatuck Valley Regional (CNVR) Planning Office. This data is contained in the Economic and Social Analysis Appendix. Land use characteristics for both communities are important as much of the Mad River watershed above the study area lies in the town of Wolcott. Future unrestrained development of the upper watershed could increase flood stages in the Woodtick area.

The recent development trend in Waterbury has been the construction of multi-family residential buildings in the outlying areas of the city. According to the Connecticut Department of Housing, Waterbury led the state in the number of new housing units authorized for construction during 1985. Land use in the Woodtick area reflects this recent trend toward high density residential development with close to 1,000 apartment and condominium units. Little vacant land remains in the Woodtick area.

Land use in the upper watershed in Wolcott is more restricted, as much of the town is without municipal sewer or water systems. A moratorium on multi-family housing has been voted in changing the minimum lot size from 5 to 15 acres for apartment and condominium complexes and restricting them to areas with existing sewer lines. The bulk of residential property in Wolcott is zoned for single family and duplex homes with a minimum lot size of 1-1/2 acres. Portions of the Mad River watershed in Wolcott are zoned for industrial park and commercial use. However, few applications for building have been received, and these areas remain largely undeveloped.

## **BASIN DESCRIPTION**

The Mad River originates at Cedar Swamp Pond in Wolcott and Bristol, Connecticut and flows in an erratic southwesterly course for about 11 miles to its confluence with the Naugatuck River in Waterbury (see Plate 2). The Mad River

has a total drainage area of 26.4 square miles and a total fall of about 640 feet. The watershed is quite steep and the lower portion is heavily urbanized.

The Woodtick area is located about 3 miles upstream from the mouth of the Mad River between Frost Road and Sharon Bridges. In this 3,800-foot reach the river varies in width from 25-60 feet and has a flat gradient of about 4 feet per mile. The drainage area of the Mad River at Woodtick is about 17 square miles.

## **CLIMATOLOGY**

The Mad River watershed has a variable climate and frequently experiences periods of heavy precipitation produced by local thunderstorms and larger weather systems of tropical or extra-tropical origin. The basin lies in the path of the prevailing "westerlies" which produce frequent weather changes. The average annual precipitation in the basin is about 48 inches distributed rather uniformly throughout the year. Monthly extremes range from a high of more than 16 inches in August 1955 to less than 0.2 inches on several occasions. The average annual temperature in the basin is about 50 degrees Fahrenheit (F), ranging from an average July temperature of 73 degrees F to a January average of 28 degrees F. Temperature extremes range from occasional highs of over 100 degrees F to infrequent lows below 0 degrees F. Average annual snowfall varies from about 40 inches in the lower Naugatuck basin to about 70 inches at the higher elevations generally occurring in December through March. Based on snow courses by the Corps of Engineers in the general region water content of the snow cover usually reaches a maximum in late February averaging about 2.0 inches with some years as high as 6.0 inches.

## **STREAMFLOW**

There are no long-term streamflow records for the Mad River. At the request of the Corps of Engineers, a temporary peak stage gage was installed near the mouth of the river in 1984 by the U.S. Geological Survey. There have been no significant high flows since the installation of the gage.

## **FLOOD HISTORY**

The Woodtick area has had a history of flooding from the Mad River. Unfortunately, there were no streamflow gages on the Mad River to record past flood discharges. The following estimates of peak discharges along the Mad River in the Woodtick area are based on recorded peak discharges of neighboring comparable streams, net local inflows to the Naugatuck River, relative storm

rainfalls, miscellaneous high water information and computed discharge ratings. This data is shown in Table 2.

**TABLE 2**  
**HISTORICAL PEAK DISCHARGES**  
MAD RIVER AT WOODTICK

<b><u>Estimated Peak Discharge</u></b> (cubic feet per second)	<b><u>Flood Event Date</u></b>
4,000	August 1955
3,500	June 1982
3,100	October 1955
2,600	January 1979
2,600	December 1948
2,300	September 1938

Descriptions of the most destructive floods within the Mad River Basin over the past 50 years are contained in the Hydrologic Analysis Appendix.

## **HYDROPOWER**

There are no existing or proposed hydropower facilities along the Mad River. Future hydropower development is unlikely due to the relatively small drainage area of the Mad River watershed which does not provide sufficient flows to justify power generation.

## **ENVIRONMENTAL SETTING**

The Woodtick area consists primarily of residential development, including several apartment and condominium complexes. There are also some light manufacturing companies and a large retail shopping mall in this area.

### **Topographic Features**

The study area is located about 2.5 miles east of downtown Waterbury in the upland section of the New England Physiographic Province. The local topography is generally characterized by moderately steep valleys and smooth hills.

At the upstream end of the problem area the river flows through a plain which has elevations of about 460 to 470 feet NGVD and is about 1 mile wide. The surrounding hills are about 600 to over 800 feet NGVD in elevation. Near Frost Road Bridge the river valley becomes constricted. The channel is confined between the 400-foot NGVD contours to less than a 50-foot width in places.

#### Geologic Features

Bedrock in the study area is Pre-Cambrian Waterbury Gneiss, a resistant metamorphic rock type. Rock is exposed mainly at the peaks and sides of the higher hills. Most of the area is covered by glacial deposits. Valleys are filled with assorted glacial till deposits of sand and gravel and in the study area, the Mad River flood plain deposits consists of recent alluvial silts and sands with organic matter and scattered gravels and boulders. Alluvial deposits may overlie glacial till in places. Bedrock is probably as much as 80 feet deep below the flood plain but becomes shallower near hills.

#### Water Quality

The water quality of the Mad River in the Woodtick area is rated as Class B by the State of Connecticut. Class B waters provide excellent fish and wildlife habitat, have good aesthetic value and are suitable for agricultural and industrial uses, bathing and other recreational purposes. The quality criteria for Class B waters are contained in the Environmental Assessment.

#### Vegetation

Vegetation from Frost Road Bridge to Bouffard Avenue consists of a narrow though dense band of trees, shrubs and various forbs and grasses. From Bouffard Avenue to Sharon Road Bridge there is a very narrow band of various herbaceous vegetation interspersed with residential lawns. Vegetated areas are densely populated and contain a wide variety of both native and escaped domestic plant species. Aquatic vegetation is relatively sparse and is composed mainly of emergent plants along the riverbanks. Table II of the attached Environmental Assessment contains a list of plant species found in the Woodtick area.

#### Fish and Wildlife

The following fish and wildlife species were noted during field investigations conducted by Corps personnel on 24 July 1985 and U.S. Fish and Wildlife personnel on 11 October 1984.

Invertebrates - The project area is populated by numerous dragonflies (Odonata) and other terrestrial and aquatic insects. Crayfish (Decapoda) were noted in the river. Limited benthic sampling by U.S. FWS personnel revealed a substantial population by Caddis Fly (Trichoptera) larva.

Fisheries - Fish species found in the project area (based on coordination with the Connecticut Fisheries Unit) include suckers (Catostomidae), White Suckers (Catostomus commersoni), Blacknose Dace (Rhinichthys attratulus), sunfish (Centrarchidae), various minnows and possibly some Eels (Anquilla rostrata). Brown Trout (Salmo trutta) and Brook Trout (Salvelinus fontinalis) are stocked upstream of the project area. Some trout are found as far downstream as the Woodtick area which experiences limited usage as a recreational fishery for this reason.

Birds - Bird species noted during field investigations include Mockingbirds, Blue Jays, Robins, House Sparrows, Common Grackles, Cardinals, American Gold Finches and Sparrows. All of these birds may be nesting in the project area which provides excellent songbird habitat. Tracks of wading birds were observed in the vicinity of Bouffard Avenue. It is apparent that at least some wading birds use the Mad River as a feeding ground.

Mammals - During field investigation, Muskrats (Ondatra zibethica) and Eastern Chipmunks (Tamias striatus) were sighted in the project area. Signs of Racoons (Procyon lotor), Mink (Mustela vison), and Norway Rats (Rattus norvegicus) were noted.

#### Threatened and Endangered Species

There are no known threatened or endangered species of plants or animals or their critical habitat in the project area except for occasional transient individuals.

#### Archaeological and Historical Resources

The potential for archaeological and historical resources in the Woodtick area is extremely unlikely due to the severe land modifications which occurred during the construction of the Royal Crest Apartments, Naugatuck Mall, Royal Crest Apartments, sewer line, parking lots, retaining walls and slope protection measures. All structures in the Woodtick area were built in the 20th century.

#### Recreation

There is little opportunity for public access to the river in the Woodtick area as most of the adjacent land is privately owned. In areas where access does exist, use by recreational fishermen is limited.

### **III. PROBLEM IDENTIFICATION**

This section describes the most probable future conditions and related water resource problems for the study area assuming no new Federal water resources project is constructed. Alternatives presented later in this report are assessed and evaluated by comparing them to the "without project" condition.

#### **WITHOUT PROJECT CONDITIONS**

##### Future Economy

As heavy industry continues to decline in Waterbury, employment is expected to shift to the more diversified light manufacturing industries and the retail trade and services sector. No overall employment loss is expected, merely a shift in the economic base of the area.

##### Future Population

According to the 1980 Census, Waterbury had a population of 103,266. This represents a decline of 4.4 percent since 1970. Population projections by the Naugatuck Valley Regional Planning Agency indicate a 2.75 percent decrease for the city of Waterbury between 1985 and 2000. This reflects a continuing trend toward suburbanization. Increases in population are projected over this same period for the other twelve communities which comprise the CNVR. Populations projections are shown in the Economic and Social Analysis Appendix Table 5.

##### Future Land Use

It is anticipated that the recent trend of multi-family residential development in Waterbury will continue as the demand for smaller and more affordable housing units grows and real estate prices in neighboring suburbs rise. Highway improvements have also made the Waterbury area more accessible to the region.

Development in Wolcott is expected to be slow and very restricted because of the lack of sewer and water lines in many parts of the town.

### Future Flooding

In the absence of flood control improvements, periodic flooding will continue to threaten the health and safety of people working and living in the Woodtick area. Property owners will continue to suffer the economic hardships that result from flood losses. At current price levels annual average flood losses are estimated at \$220,000 based on January 1986 price levels. If a flood having a 100-year (1 percent) chance of annual occurrence were to happen, it would result in approximately \$3.8 million in losses.

## **PROBLEMS AND OPPORTUNITIES**

### Flood Problem

Flooding conditions in the Woodtick area have been aggravated by the increased development in the flood plain along with the resulting accumulation of silt and debris in the channel over the past decade. Extensive filling of the flood plain in the Woodtick area occurred during the early seventies, when approximately 60 acres of low-lying wetlands along the west bank of the river were developed for a shopping mall and an apartment complex. These developments have resulted in the loss of most of the natural flood storage areas in this reach. The placement of this fill has also raised this land higher than the opposite bank. Also, filling of the flood plain along the east bank of the river has occurred in connection with the construction of single family homes, but to a much lesser degree. Filling of land adjacent to the river is continuing in the vicinity of Sharon Road.

The most recent major flood along the Mad River occurred in June 1982. This flood resulted from a storm which settled over southern New England, dropping about 10 inches of rainfall in the Waterbury area. The estimated 100-year (1 percent annual chance) flood boundary for the Woodtick area is shown on Plate 3.

The June 1982 flood was an event with an estimated 2 percent annual chance of recurrence. Under existing development conditions this flood would affect approximately 19 private homes, 478 apartment and condominium units, 1 commercial building and 3 light industrial enterprises. Total flood losses attributable to a flood similar to the June 1982 event, are estimated at over \$2.6 million.

Flooding also caused considerable damage to residential property along this reach during March and April 1983.

## **PROBLEM AND OPPORTUNITY STATEMENTS**

The following problem and opportunity statements evolved during study activities based on concerns and comments expressed by the city of Waterbury, the Connecticut Department of Environmental Protection (DEP) and local interests.

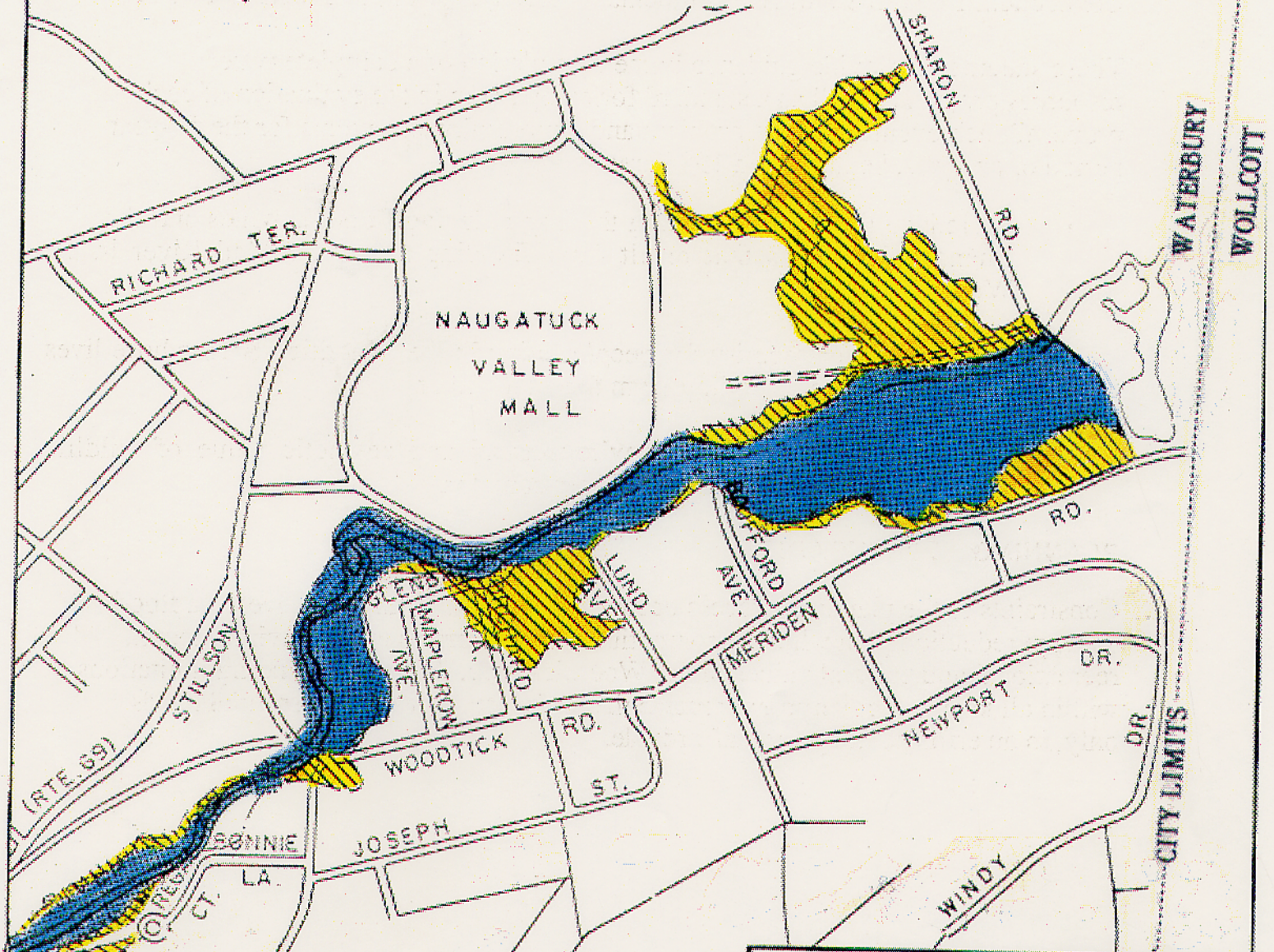
These statements provide guidance in the formulation of a complete water resources project, as well as a standard for comparison in the evaluation of each proposal's achievements. The problem and opportunity statements for the 50-year period of analysis, beginning in 1986 are:

- To reduce the risk of flooding thereby reducing flood damages and the financial hardships that result from flooding along the Mad River in the Woodtick Area.
- Provide greater security for people living in the Woodtick Area whose lives are threatened by flooding from the Mad River.
- Preserve and enhance the environmental and aesthetic value of wildlife habitat located along the Mad River corridor.

## **PLANNING CONSTRAINTS**

Constraints to the planning process occur in two areas. First is to develop a flood damage reduction plan which is compatible with or improves the environmental, recreational and cultural values of the Woodtick area. Secondly, funding limitations within all levels of government require the project to provide for essential needs only, in an effort to keep costs affordable.





APPROXIMATE SCALE  
400ft. 0 400ft.



100 - Year Flood Standard Project Flood (SPF)

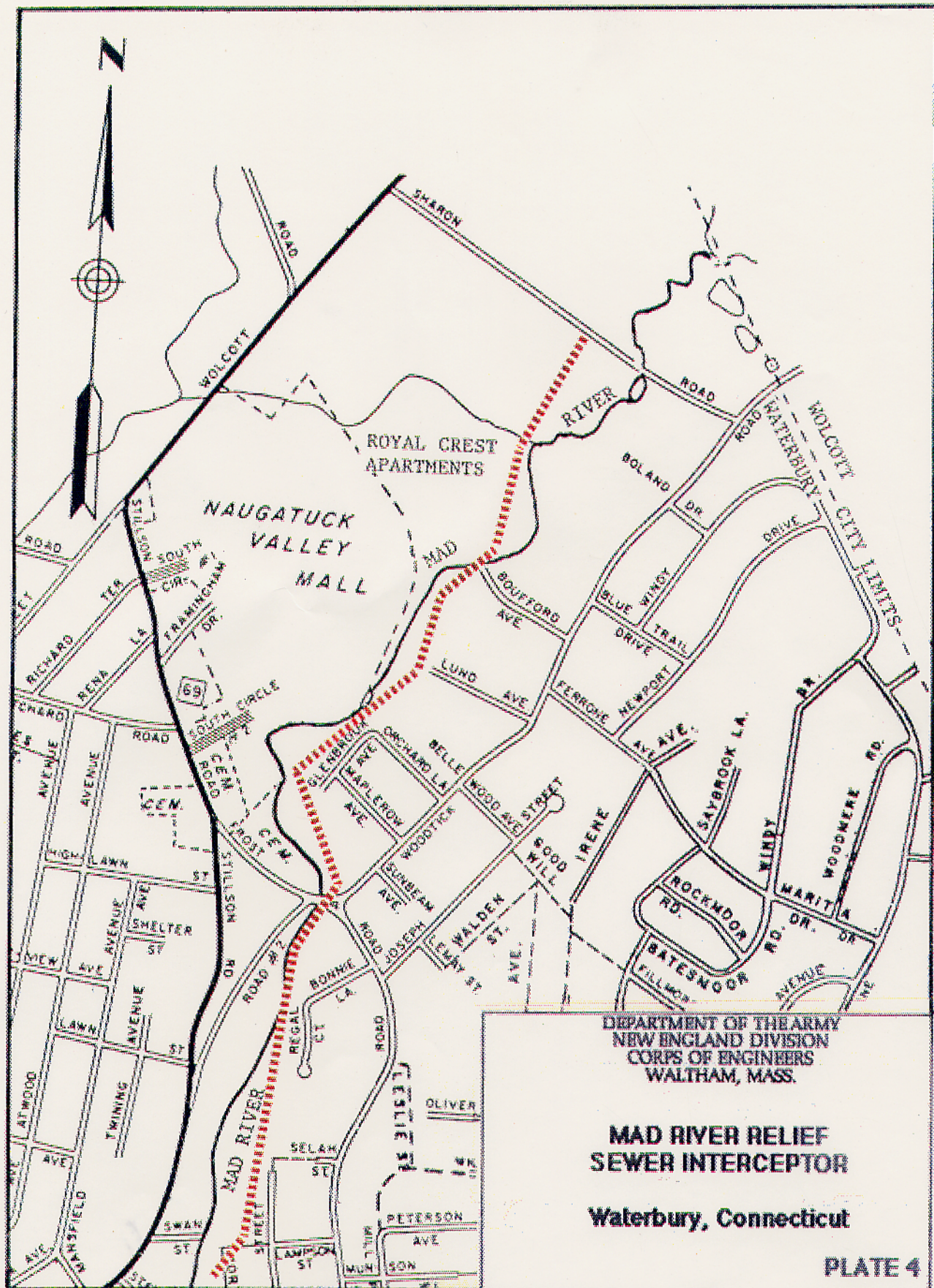
DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WALTHAM, MASS.

**MAD RIVER BASIN  
FLOOD PLAINS**

**Waterbury, Connecticut**

**PLATE 3**





SCALE IN FEET  
300 0 300 600



## **IV. PLAN FORMULATION**

This section describes the range of alternative plans considered to reduce flood damages in the Woodtick area. Alternatives were investigated in sufficient detail to determine their economic and engineering feasibility, the impacts of their implementation and public acceptance. The plan that reasonably maximizes net national economic development (NED) benefits, consistent with the Federal objective, is identified as the NED plan. Those alternatives that warranted further study are presented at the end of this section.

### **THE FEDERAL OBJECTIVE**

The Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment. Contributions to national economic development are increases in the net value of the national output of goods and services, expressed in monetary units.

### **PLANS OF OTHERS**

Plans that address or affect the problems and opportunities in the study area that have been or are proposed to be implemented by Federal or non-Federal agencies are described in the following paragraphs.

In 1974, extensive channel modifications were constructed in the Woodtick area between Bouffard Avenue and Sharon Road Bridge. This work was performed for the Royal Crest Estates apartment complex. Prior to 1974, this stretch of the river contained several small meanders and varied between 20 to 40 feet in width. Modifications to the Mad River consisted of channel straightening and widening to 50 feet. This work, however, failed to protect the Royal Crest Estates from future flooding.

Plans and specifications for the construction of the Mad River Sanitary Sewer Interceptor have been prepared for the U.S. Environmental Protection Agency. The interceptor is designed to convey sewage from the town of Wolcott to Waterbury for treatment. The alignment of the interceptor will traverse along the Mad River through the Woodtick area as shown on Plate 4. Construction is scheduled during the summer of 1987.

## **FLOOD PROTECTION MEASURES**

Flood protection measures fall into two basic categories: structural and nonstructural. Structural measures are those which modify flood behavior while nonstructural measures modify flood plain use. Nonstructural measures do not reduce the threat of flooding. The two general categories of flood protection measures are shown in Table 3.

**TABLE 3**  
**ALTERNATIVE FLOOD CONTROL MEASURES**

### **I. STRUCTURAL**

- A. Located Upstream of Critical Damage Area
  - 1. Reservoirs
  - 2. Bypasses
  - 3. Land Treatment
- B. Located at the Critical Damage Area
  - 1. Levees and Floodwalls
  - 2. Channel Modification

### **II. NONSTRUCTURAL**

- A. Reduce Actual Damages
  - 1. Floodproofing
  - 2. Relocation
  - 3. Land Use Regulations and Zoning
  - 4. Flood Warning and Emergency Evacuation
- B. Mitigate Damages
  - 1. Flood Insurance

## **PLAN FORMULATION RATIONALE**

The plan formulation process involves the development and evaluation of those management measures previously described in Table 3. Each measure was assessed in terms of its effectiveness, efficiency, completeness and public acceptability. Alternatives that did not address the problems and opportunities of the study area were eliminated. Under Corps guidelines the selected plan must exhibit a benefit-cost ratio (BCR) greater than unity and the greatest net benefits. The following sections provide information on plan description, evaluation and comparison which lead to the selection of the most feasible and economically effective plan.

**RESERVOIRS:** Scoville Reservoir located in Wolcott about 1.5 miles upstream of the Woodtick area was one site investigated for possible upstream flood control storage. The surface area of Scoville Reservoir is 130 acres at spillway crest elevation 525 feet NGVD. Increasing the height of the dam by 10 feet would provide about 1,600 acre-feet of flood storage capacity, which is equivalent to about 3.5 inches of runoff from its 8.5 square mile drainage area. It was found that the modification of Scoville Reservoir would require extensive road relocation as well as levee construction and would only reduce downstream flood flows by approximately 20 percent. Based on this analysis, upstream storage is not considered a physically viable flood control alternative.

**FLOOD FLOW BYPASSES:** A method of modifying floodflows before they reach the Woodtick area would involve diverting excess flow around the area either by a surface channel by-pass or by an underground tunnel. Studies indicated that a surface bypass would not be feasible because of dense development in the study area that would have required relocation of properties to be protected. Similarly, the cost to construct a tunnel bypass to divert flood flows was found to far exceed expected benefits. Because of other cost effective alternatives, diversion measures were eliminated from further study.

**LAND TREATMENT:** Although adopted primarily to further good agriculture and forestry practices, land treatment and watershed management measures have beneficial effects on flood conditions. Modifying or preserving vegetation cover conserves water by increasing infiltration and reducing surface runoff. The effect on flood discharges varies with the watershed, the characteristics of flood producing storms, and antecedent surface conditions. In general, land treatment usually does not reduce flood stages significantly, but does contribute to preventing their future increase. Over 70 percent of the land in the upper Mad River watershed is undeveloped. Treatment of the developed land would have a limited effect on reducing flooding in the Woodtick area. This alternative was eliminated from further consideration. Continued use of this measure by other public and private interests would, however, improve and protect upstream agricultural and forest lands and prevent flood stages from increasing as development occurs.

**LEVEES & FLOODWALLS:** A plan to construct levees and floodwalls along both banks of the Mad River extending from Bouffard Avenue upstream to Sharon Road Bridge was investigated. A total of 3,500 linear feet of levees and floodwalls ranging in height from 4.5 to 7 feet would be required to provide protection against an event with a 1 percent chance of annual occurrence. This plan would reduce annual flood losses by about 80 percent. This alternative has an estimated first cost of \$2.2 million, not including costs of facilities to handle interior drainage. Construction of levees and floodwalls would restrict visual and pedestrian access to the river and require limited removal of riparian vegetation.

**CHANNEL MODIFICATIONS:** Two plans of channel modifications were considered during this investigation.

(Plan A) **Entire Reach** - This plan involves widening and deepening the entire channel for a distance of about 1 mile, from Sharon Road Bridge to approximately 1,000 feet downstream of Frost Road Bridge. The invert of the existing channel would be lowered an average of 2 feet throughout this reach. The proposed channel would have a 50-foot bottom width with 2 horizontal to 1 vertical side slopes. A 2-foot layer of stone slope protection (riprap) on a 1-foot layer of gravel bedding would be placed around bridge abutments and along unprotected areas of the riverbank to prevent erosion.

Retaining walls would be required in two reaches of limited width near Bouffard Avenue and downstream of Frost Road Bridge, to provide adequate flow area and to prevent erosion. This alternative has an estimated first cost of \$1.7 million. This plan would reduce estimated annual flood losses by approximately 82 percent. Construction of this plan would disturb fish habitat and require the removal of nearly all of the riparian vegetation that exists along this total reach of the Mad River.

(Plan B) **Localized Areas** - This plan involves widening the left bank of the existing channel along two separate reaches of the Mad River, totaling 1,270 linear feet, which were determined to be the most restricted in the study area. These two reaches are located in the vicinity of Frost Road Bridge and opposite Bouffard Avenue (see Plates 5 and 6). Flood flows in these areas are restricted as a result of encroachment into the channel flow area by developments and the accumulation of silt and debris. The proposed channel would have a 50-foot bottom width with 2 horizontal to 1 vertical side slopes. Riprap and concrete retaining walls would be used to protect bridge abutments, utility crossings, storm drain outlets, and unprotected areas of the riverbank from erosion. This alternative has an estimated first cost of \$1,055,000. This plan would reduce estimated annual flood losses by approximately 64 percent. Construction activities would disturb some fish habitat

and require the removal of about 0.3 acres of riparian vegetation in the areas of proposed channel work.

**FLOODPROOFING:** Flood damage surveys have identified a total of 55 flood prone structures in the Woodtick area. Table 4 indicates the number of dwelling units in these buildings.

**TABLE 4**  
**FLOODPRONE STRUCTURES, WOODTICK AREA**

	Dwellings	
	<u>Buildings</u>	<u>Units</u>
<u>Residential</u>		
Apartments	23	363
Condominiums	10	114
Duplex	1	2
Single Residences	19	19
<u>Commercial</u>	1	1
<u>Industrial</u>	1	3
<b>TOTAL</b>	<u>55</u>	<u>502</u>

The cost to just relocate unities in 19 single residences would be in excess of \$500,000. The cost to floodproof all flood prone structures would far exceed the cost of structural measures. In addition, studies performed by the Corps of Engineers Hydrologic Engineering Center in Davis, California have shown that floodproofing measures are generally only feasible for structures that experience frequent flooding (recurrence interval of 25 years or less). As shown by the stage-frequency curves in the Hydrologic Analysis Appendix, the majority of flood losses in the Woodtick area occur at the less frequent events with recurrence intervals of 50 years or more. For these reasons and the fact that residences would be introduced to the risk of isolation during flood periods since flood stages in the area would not be reduced, floodproofing is not considered to be a viable flood damage reduction alternative.

**RELOCATION:** There are 55 flood prone structures in the Woodtick area. The cost to relocate this number of structures would exceed expected benefits. The social and economic impacts of this action would be too great to quantify. This alternative was not considered further.

**LAND USE REGULATION AND ZONING:** The city of Waterbury joined the Regular phase of the National Flood Insurance Program on 1 November 1979. As a condition of participation in the Regular phase, the city has adopted management regulations which limit construction within the 100-year flood plain (an event having an estimated 1 percent annual chance of occurrence). This will restrict future construction in flood prone areas of the basin and should help to prevent flood conditions in the Woodtick area from worsening. However, land use regulation and zoning would have little or no effect on reducing existing flood stages and was not selected for additional investigation.

**FLOOD WARNING AND EMERGENCY EVACUATION:** Flood forecasting, warning and evacuation is a measure to reduce flood losses by charting out a plan of action to respond to a flood threat. Due to the flashy nature of the Mad River, residents of the Woodtick area would not have adequate flood warning. In addition, the majority of flood prone structures in the Woodtick area are apartments. Because of the transient nature of the people renting these apartments, public education of flood warning and evacuation measures would be very difficult and response to flood warnings would most likely be inadequate.

**FLOOD INSURANCE:** The National Flood Insurance Program was created by Congress so that property owners in areas subject to flooding would be able to buy insurance at a reasonable cost. In return for this subsidized protection, communities which have identified flood plains must adopt certain minimum measures, as described above, to help reduce the effects of flooding. A property owner cannot obtain subsidized flood insurance unless the community agrees to participate in the program.

As a condition of participation in the Regular phase of the National Flood Insurance Program, the community must require that all new construction, as well as substantial improvements to existing structures, within flood prone areas be elevated or floodproofed against the "100-year" flood. The city of Waterbury joined the Regular phase of the Flood Insurance Program on 1 November 1979.

Flood insurance provides a method of reimbursement for most losses incurred as a result of flooding. Because flood insurance is presently available in Waterbury, it is part of the "without project condition" and was not studied further. Purchasing flood insurance is recommended in the absence of a plan that reduces actual damages.



## COMPARISON OF ALTERNATIVES

Comparison of alternatives resulted in the designation of the localized channel modification plan as the most cost effective NED plan, because it reasonably maximizes net benefits of goods and services.

**TABLE 5**  
**COMPARISON OF ALTERNATIVES**

(January 1987 Price Level)

<u>Plan</u>	<u>First</u> <u>Cost</u>	<u>Annual</u> <u>Cost</u>	<u>Annual</u> <u>Benefits</u>	<u>Net</u> <u>Benefits</u>	<u>B/C</u> <u>Ratio</u>
Reservoirs		<i>not physically viable</i>			
Bypass		<i>not cost effective</i>			
Land Treatment		<i>not effective</i>			
Levees & Floodwalls	2,200	207.6	187.3	<i>none</i>	0.9 to 1
Channel Modifications					
Entire Reach	1,700	162.3	190.6	28.3	1.2 to 1
Localized Mod.	1,055	99.5	150.0	50.5	1.5 to 1
Floodproofing		<i>not cost effective</i>			
Relocation		<i>not cost effective</i>			
Land Use Reg. & Zoning		<i>not effective</i>			
Flood Warning & Emergency		<i>not effective</i>			
Evacuation		<i>not effective</i>			
Flood Insurance		<i>existing condition</i>			

## CONCLUSION

Our investigation have concluded that localized channel modifications to the Mad River to maximize net benefit is, therefore, designated as the NED plan. The effects of the channel improvements would be to reduce recurring 100-year (1 percent annual chance) flood stages in the Woodtick reach of the Mad River by about 1-1/2 feet between river station 23+200 (800 feet downstream from the Frost Road Bridge) and station 28+250 (Sharon Road). The improvements would not eliminate all flooding at the 100-year (1 percent annual chance) flood level, but would greatly reduce damages with most residual flooding limited to shallow (less than 1/2-foot) street and parking lot flooding.

## V. SELECTED PLAN

### DESCRIPTION

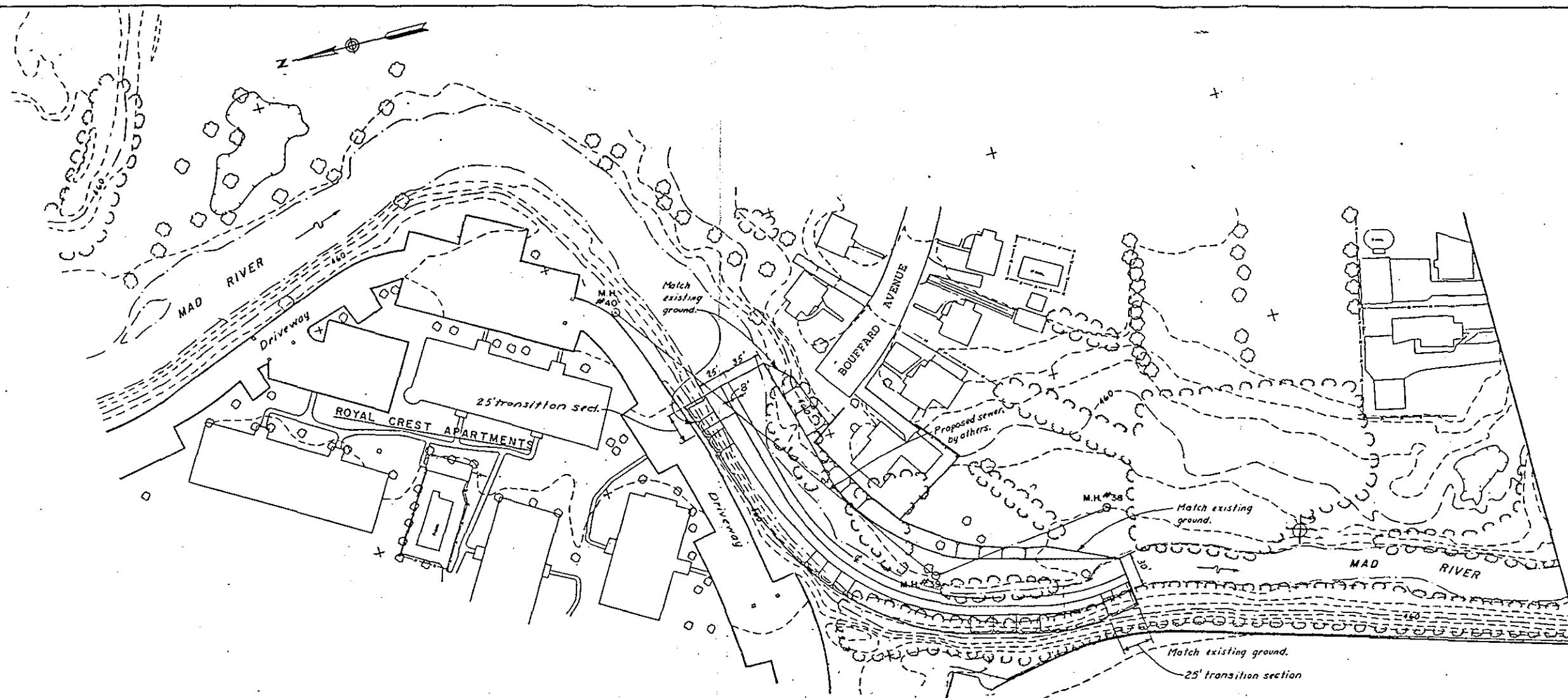
The selected plan consists of channel widening along two areas on the left bank of the Mad River, totaling 1,270 linear feet (see Plates 5 and 6). These areas are located in the vicinity of Frost Road Bridge and near Bouffard Avenue. Encroachment into the channel and the accumulation of silt and debris has restricted flood flows in these areas.

The selected plan is the minimum practical channel improvement. This plan optimizes the hydraulic efficiency of the river channel, while reducing annual flood losses by 64 percent. Further enlargement of the channel was found to minimally increase flood control benefits over the selected plan. Extensive channelization both upstream and downstream of Bouffard Avenue would be required to further reduce flood stages. Such a plan would increase construction and real estate costs, but yield less net benefits than that of the selected plan.

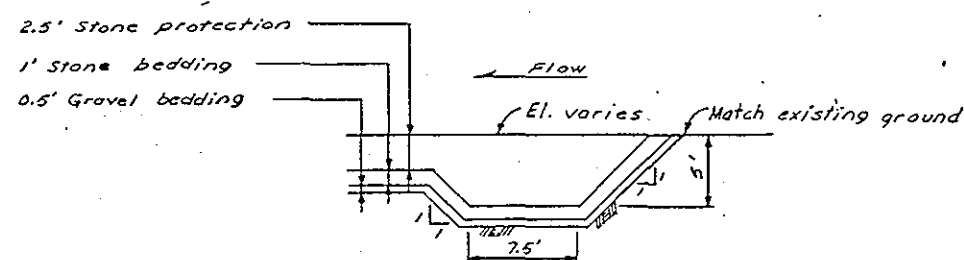
The proposed channel would have a 50-foot bottom width with 1 vertical to 2 horizontal side slopes. A 2-foot layer of stone protection resting on a 1-foot layer of gravel bedding would be placed around the abutments of Frost Road Bridge and along unprotected areas of the riverbank to prevent erosion. Utility crossings and storm drain outlets in the work areas would also be protected with stone protection. Approximately 420 linear feet of concrete retaining walls, varying in height from 8-14 feet, would be constructed along the riverbank in two areas downstream of Frost Road Bridge where there is insufficient space for stone slope protection (see Plates 5 and 6).

A low flow channel was incorporated into the design of the channel improvements (see Plate 5). The low flow channel preserves existing water depth during periods of seasonal low flow, thus maintaining the existing hydraulic flow characteristics of the river for sediment transport. In addition, the low flow channel would maintain the minimum water depth for fish passage during periods of low flow.

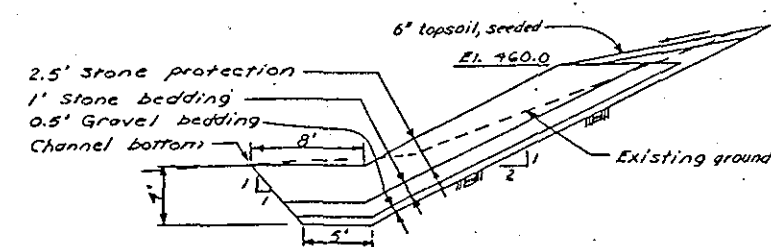
Channel work can be accomplished with tracked equipment from the streambank. Traversing of the riverbed with equipment would be kept to a minimum. A temporary cofferdam would be placed along the channel in areas of retaining wall construction to divert streamflows away from the work area, if necessary.



APPROXIMATE SCALE

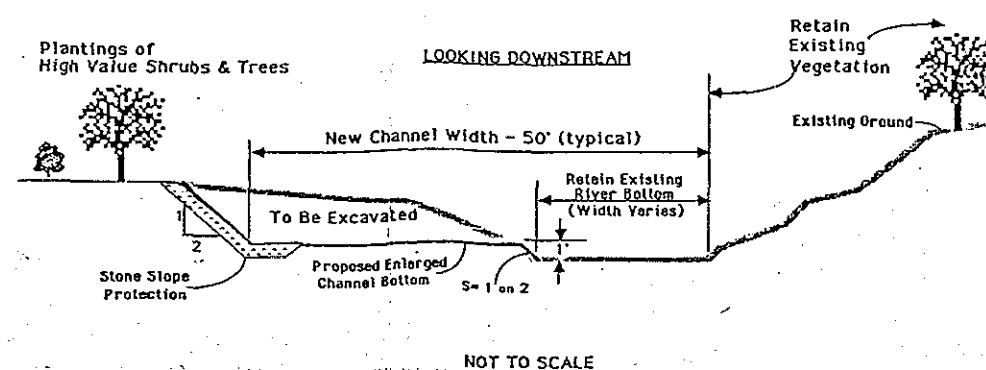


TYPICAL TRANSITION SECTION  
NO SCALE

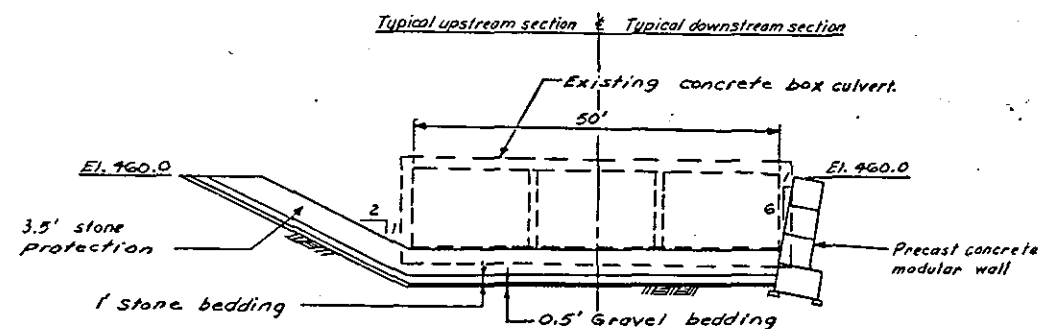
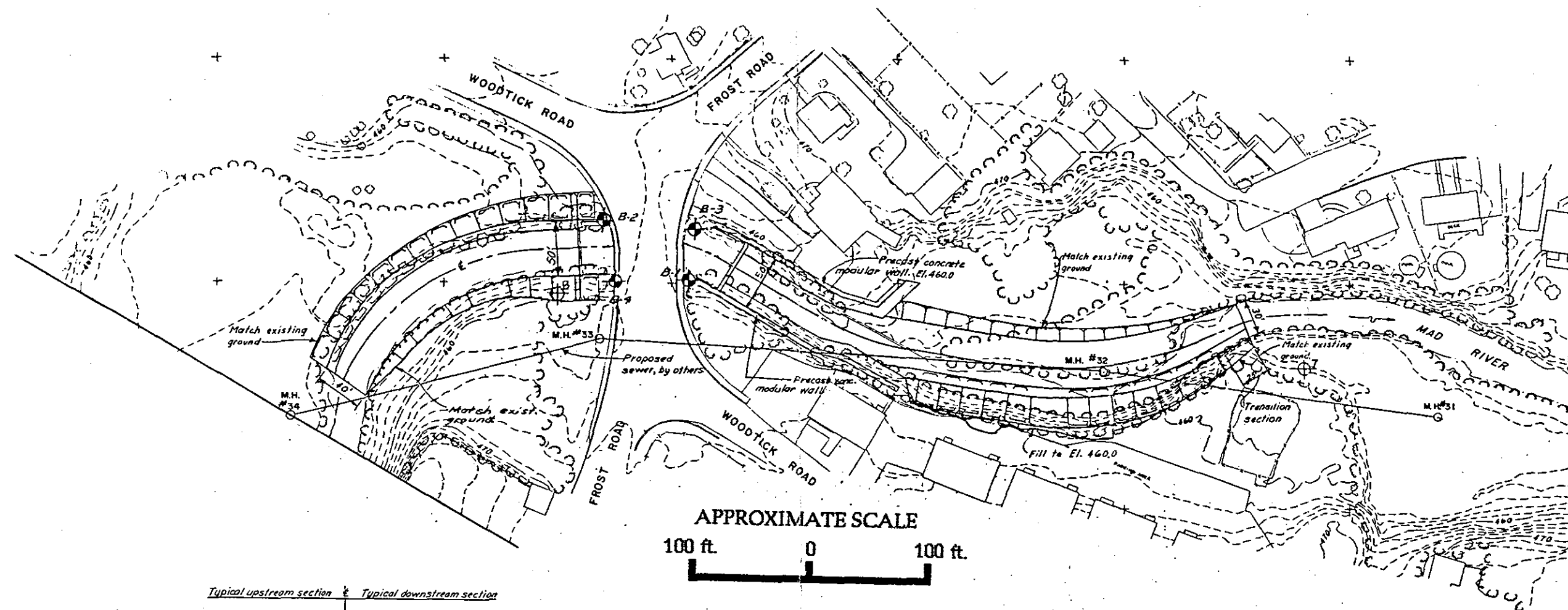


TYPICAL STONE PROTECTION SECTION  
NO SCALE

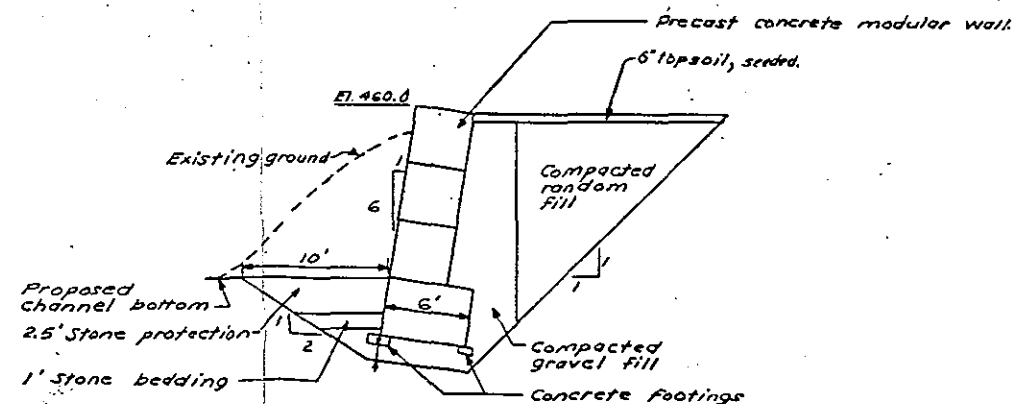
### Typical Widened Section - Mad River Waterbury (Woodtick Area), Connecticut



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WATERBURY, CT.  
WATER RESOURCES DEVELOPMENT PROJECT  
LOCAL PROTECTION PROJECT  
SELECTED PLAN  
MAD RIVER CONNECTICUT



STONE BLANKET UPSTREAM AND  
DOWNSTREAM OF FROST ROAD BRIDGE  
NO SCALE



TYPICAL CONCRETE  
MODULAR WALL SECTION  
NO SCALE

NOTES:  
1. Stone blanket shall extend 50 ft. upstream & 50 ft. downstream of Frost Road Bridge.

LEGEND  
7-3 Exploration performed by Associated Borings Company Inc. for the City of Waterbury, 7-9 August, 1989.  
8-1 Exploration performed by the Hollar Testing Labs Inc. for the City of Waterbury April, 1965.

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WALTHAM, MASS.  
WATER RESOURCES DEVELOPMENT PROJECT  
WATERBURY, CT.  
LOCAL PROTECTION PROJECT  
SELECTED PLAN  
MAD RIVER CONNECTICUT

The present alignment of the Mad River Relief Interceptor crosses both work areas of proposed channel widening. If both the local and Federal projects are constructed as presently designed, two manholes would be located in the proposed channel. Coordination with local consultants indicated that the two manholes can be relocated during construction with only minor adjustments to the sewer alignment during construction.

Through coordination with the Connecticut DEP Fisheries Unit, several environmentally-oriented elements have been incorporated into the selected plan to minimize adverse affects on environmental resources in the Woodtick area. These measures include the following:

- Construction activities would be restricted to seasonal low-flows between 1 July and 30 November. This would minimize turbidity and siltation of the river during construction as well as the possibility of streambank erosion.
- After channel widening of the left bank is complete boulders will be randomly placed in the widened channel. These boulders will provide cover for aquatic animals and help to create stream substrate conditions similar to those presently existing in the current channel. Such measures will help to protect the fishery resource and preserve the quality of aquatic habitat available.
- Plantings of high value wildlife vegetation be placed on the widened channel banks to minimize the increase of water temperature that would be associated with the removal of vegetation in the areas of proposed channel work.

## **COSTS**

Estimated first costs of the localized channel modification plan are shown in the following table.

**TABLE 6**  
**FIRST COSTS OF SELECTED PLAN**

(January 1987 Price Level)

<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>COST</u>
Site Preparation	1	Job	Lump Sum	\$5,000
Excavation	20,000	C.Y.	\$6	120,000
Stone Protection	2,850	C.Y.	35	99,750
Stone Bedding	1,300	C.Y.	30	39,000
Gravel Bedding	800	C.Y.	15	12,000
Compacted Random Fill	2,000	C.Y.	5	10,000
Compacted Gravel Fill	1,500	C.Y.	20	30,000
Concrete Footings	50	C.Y.	150	7,500
Concrete "Doublewal"	7,200	S.F.	30	216,000
Top Soil & Seeding	3,400	S.F.	3	10,200
<b>SUBTOTAL</b>				<u>\$ 549,450</u>
Contingencies (20%)				109,890
Real Estate				<u>204,400</u>
<b>TOTAL CONSTRUCTION COST</b>				<b>\$863,700</b>
Engineering & Design				120,000
Supervision & Administration				71,600
<b>TOTAL FIRST COST</b>				<b><u>\$1,055,000</u></b>

**PROJECT OPERATION**

The project upon completion will be turned over to the local sponsor(s) as their responsibility to operate and maintain. Local interests will pay the cost of all lands, easements and rights-of-way, utility relocations and alterations, and all alterations of highway bridges necessary for the purpose of flood damage reduction. The project is designed to be complete-within- itself and should not commit the Federal Government to any future work.

Following construction of the project, the local sponsor is responsible to maintain the project between river station 23+000 and station 28+250. An Operation and Maintenance Manual will be prepared by the New England Division and forwarded to the responsible parties. This manual will reflect project features, as actually built, and provide direction regarding their proper operation and maintenance. The completed project will be inspected semi-annually by personnel from the New England Division, together with the responsible parties, to insure proper operation and maintenance as prescribed by the Secretary of the Army.

It should be noted that estimated operation and maintenance costs, included herein, are provided for economic analysis only and are not included in project first costs. The local sponsor(s) would be required to perform periodic channel maintenance (estimated every 3-5 years) involving removal of any sediment accumulation in excess of 1-foot, and any woody plants (brush) on channel bottom in excess of 1-inch in diameter, that would otherwise infringe upon the carrying capacity of the channel and reduce the effectiveness of the project. Areas of proposed riprap protection would require periodic maintenance to control vegetation and replace riprap rock dislodged by flooding, vandalism or other means. Operation and maintenance costs are estimated at \$2,000 annually. The local sponsor(s) are aware that their responsibility includes future funding of all operation and maintenance items which should be budgeted for accordingly.

## **PLAN ACCOMPLISHMENTS**

Construction of localized channel modifications would reduce the risk and severity of future flood losses in the Woodtick area. The proposed project would reduce flood stages resulting from the 1 percent annual chance (100-year) flood by approximately 1.5 feet from 463 to 461.5 feet NGVD. This stage reduction would greatly reduce monetary losses and limit residual flooding to low-lying areas, which are mostly parking lots, streets and lawns. It is estimated that the proposed project would reduce average annual flood losses in the Woodtick area by about 64 percent.

## PROJECT EFFECTS

Impacts of varying magnitude and longevity can be expected during two phases of project implementation: construction and postconstruction. Impacts likely to occur during construction of the project are generally short-term and site-specific. It is anticipated that there would be no adverse postconstruction impacts associated with the proposed localized channel modifications within the Woodtick area. A finding of no significant impact, and detailed descriptions of the impacts, are contained in the Environmental Assessment.

### Short-Term Impacts

Construction activities would increase turbidity and siltation of the river. These effects would be short-term and site-specific, occurring only during project construction.

The aesthetics of work areas would be affected temporarily by the presence of construction equipment. Noise and dust pollution associated with construction activities would be temporary. There would also be temporary disruption to traffic during construction with increased numbers of heavy vehicles in the area.

Fish habitat would be disturbed in areas of proposed channel excavation. Placement of rocks and boulders on the channel bottom after excavation will help to restore fish habitat. This has proven effective in similar projects throughout the country.

A positive economic impact of the plan would be the influx of temporary workers who would purchase goods and services thereby stimulating the local economy.

### Long-Term Impacts

The most significant impact of the selected plan would be the substantial reduction of future flood losses. It is estimated that the proposed project would reduce average annual damages in the Woodtick area by approximately 64 percent. Localized channel modifications would not significantly alter flood plain limits nor the natural flood storage characteristics of the Woodtick area. As a result, localized channel modifications would not effect downstream flood flows.



Project construction will result in the loss or alteration of 1.35 acres of combined upland and northern overflow forest habitat. This incremental loss is not a significant impact to the Mad River Corridor. Installation of the stone protection and concrete walls associated with the proposed channel widening will interfere with wildlife access to the Mad River and along the Mad River corridor at the points where this work occurs. Wildlife usage of the Mad River, however, should be relatively unimpaired.

Impacts to the fishery resources of the Mad River will be minimal. While the habitat value of the 450 and 800-foot long widened channel sections will be marginal, the installation of low flow channels in these sections will maintain free fish passage up and downstream of the project area. This measure will maintain the integrity and quality of the Mad River as aquatic habitat, and consequently, the value of the fisheries resources it contains.

In a letter dated November 22, 1985, the State Historic Preservation Officer indicated that the proposed project will have no effect on historical, architectural or archaeological resources on or eligible for the National Register of Historic Places. A copy of this letter is contained in Appendix A.

Table 7 reflects the effects of the selected plan on resources of principal national recognition. Information concerning the compliance of the selected plan with the Water Resources Council's designated environmental statutes is contained in the Environmental Assessment.

**TABLE 7**  
**EFFECTS OF THE SELECTED PLAN ON NATIONAL RESOURCES**

<b><u>Types of Resources</u></b>	<b><u>Principal Sources of National Recognition</u></b>	<b><u>Measurement of Effects</u></b>
Air Quality	Clean Air Act, as amended (42 U.S.C. 1875h-7 et seq.)	Temporary and minimal quality degradation at immediate construction sites within less than 1 square mile area.
Areas of Particular Concern Within the Coastal Zone	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)	Not applicable. The study area does not include any coastal zone areas.
Endangered and Threatened Species	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	None identified as being present in the study area. No effect.
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	Minimal loss to wildlife habitat & wetland habitat.
Flood Plains Flood Plain Management	Executive Order 11988,  of the proposed project.	Future development in flood plain would not result from construction
Historic and Cultural Properties (16 U.S.C. Sec. 470 et seq.)	National Historic Preservation Act of 1966, as amended	Not present in area.
Prime and Unique Farmland	CEQ Memorandum of 1 August 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act	Not present in project area.
Recreational Resources	Federal Water Project Recreation Act, as amended (16 U.S.C. 4601-12 et seq.)	Temporary disturbance during project construction

**TABLE 7**  
 cont'd  
**EFFECTS OF THE SELECTED PLAN ON NATIONAL RESOURCES**

<b><u>Types of Resources</u></b>	<b><u>Principal Sources of National Recognition</u></b>	<b><u>Measurement of Effects</u></b>
Water Quality	Clean Water Act of 1977 (33 U.S.C. 1251 et seq.)	Temporary turbidity and siltation. State water quality classifications would not be affected.
Wetlands	Executive Order 11990, <i>Protection of Wetlands</i> , Clean Water Act of 1977, as amended (42 U.S.C. 1857h-7 et seq.)	Minimal wetland damage will occur. Project design avoids impact to streambank wetlands as much as possible. Loss of approximately 1.35 acres mixed upland and northern over- flow forest.
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271 et seq.)	The Mad River is not designated or proposed for designation as a Wild and Scenic River.

### **ECONOMIC EVALUATION**

As shown in Table 5, the total estimated first cost of the selected plan is \$1,055,000. Amortizing this cost over 50 years at the Fiscal Year 1987 current Federal interest rate of 8-7/8 percent, results in an annual cost of \$97,500. Adding interest during construction and operation and maintenance costs results in an annual charge of \$99,500 as shown in Table 8.

**TABLE 8**  
**ESTIMATED ANNUAL COST OF SELECTED PLAN**  
**Localized Channel Modifications**

First Cost	\$1,055,000
Interest During Construction	<u>28,300</u>
<b>TOTAL INVESTMENT COST</b>	<b>\$1,083,500</b>

Estimated Annual Costs

Interest plus Amortization	\$ 97,500
Operation and Maintenance Cost	<u>2,000</u>
<b>TOTAL ANNUAL COST</b>	<b>\$ 99,500</b>

Annual benefits resulting from the implementation of the selected plan are estimated at \$150,000. Comparing this figure with annual costs yields a benefit-to-cost ratio of 1.5 to 1. An economic summary of the selected plan is contained in the following table.

**TABLE 9**  
**ECONOMIC ANALYSIS OF SELECTED PLAN**

	<u>First</u> <u>Cost</u>	<u>Annual</u> <u>Cost</u>	<u>Annual</u> <u>Benefits</u>	<u>Total Net</u> <u>Benefits</u>	<u>B/C</u> <u>Ratio</u>
<b>Selected Plan</b>	\$1,055,000	\$99,500	\$150,000	\$50,500	1.5 to 1

## **COST APPORTIONMENT**

The sole purpose of the proposed project is flood damage reduction and all costs are allocated as such. Local interests must satisfy the non-Federal cost sharing requirement of 25% of the total first cost of the project. The non-Federal share, as shown on Table 10, includes all lands easements, rights-of-way, utility relocations and bridge modifications necessary for the construction of the project; a minimum cash contribution of 5% of the total first cost; and other cash required to meet the 25% cost sharing requirement. In addition, local interests would be responsible for all costs in excess of the Federal participation cost limit of \$5,000,000, if necessary.

**TABLE 10**  
**PROJECT COST SHARING, SELECTED PLAN**

	<u><b>COST</b></u>
Federal (75 percent)	\$ 791,250
Non-Federal (25 percent)	
Lands, Easements and Rights-of-way	204,400
5% Minimum Cash Contribution	53,000
Additional Cash Contribution	6,350
<b>TOTAL FIRST COST</b>	<u><b>\$1,055,000</b></u>

## **VI. PLAN IMPLEMENTATION**

Following the review and approval of this document by the Office of the Chief of Engineers, plans and specifications for constructing channel modifications along the Mad River would be prepared by the New England Division. At this same time, a formal document would be required from the city of Waterbury and the State of Connecticut reaffirming their intent to support the selected plan and fulfill the requirements of local cooperation. Following the receipt of this formal document and the allocation of Federal construction funds, bids would be invited for the award of a contract. It is anticipated that all work involved with the proposed project can be accomplished in one construction season. Upon completion of the proposed project, the city of Waterbury and the State of Connecticut would be responsible for its operation and maintenance.

## **VII. SUMMARY OF PUBLIC COORDINATION**

Close coordination with the public was maintained throughout the study. Frequent meetings were held with the city of Waterbury and the Connecticut Department of Environmental Protection to discuss various flood control measures and to receive their comments.

During June 1986, draft copies of this report were distributed to other Federal, State, and local agencies for public review. This gave all interested parties the opportunity to comment on the findings of our study. During the public review period we received several letters of support along with several others that raised questions and concerns about the findings of our study. These letters, along with our responses, are contained in Appendix A.

Following the public review period, and subsequent coordination with the State of Connecticut, Department of Environmental Protection (DEP), a revised channel design was accepted and negotiations were completed for the Local Cooperation Agreement. We received a letter of support from the State of Connecticut,, dated 31 August 1987.

Concerns were raised by the U.S. Environmental Protection Agency in their letter of 7 August 1986, are addressed in our response of 3 October 1986 (see Appendix A).

See Appendix A, Public Involvement, at the end of this report for additional information on the extent of public coordination and correspondence during this study.

## VIII. CONCLUSION

This study was accomplished under the special continuing authority contained in Section 205 of the 1948 Flood Control Act, as amended. The proposed project is complete-within-itself and will not require additional work to insure its successful operation.

The proposed project will provide property owners in the Woodtick area with much needed protection from future flood losses. This project involves widening the left bank of the Mad River along two reaches, totaling 1,270 linear feet.

Unlike a dike or levee project, it is difficult to assign one level of protection to a channel modification project. The best indication of the protection offered by the proposed project would be its effectiveness in reducing expected annual flood losses. It is estimated that the proposed project will reduce total annual flood losses in the Woodtick area by about \$150,000 (64 percent reduction), as well as reducing 100-year (1 percent) flood levels by about 1-1/2 feet. Most residual flooding from a 100-year event would be limited to parking areas, lawns and streets. To supplement this protection, property owners in the Woodtick area can purchase subsidized flood insurance through the Federal Insurance Administration. Strict flood plain zoning and prevention of any further channel encroachment in the Woodtick area will help ensure the continued effectiveness of the proposed project.

The proposed project will increase the economic strength of property owners in the Woodtick area by reducing their risk of future flood losses. The proposed project will have no significant impacts on cultural, environmental or recreational resources within the study area. A "Finding of No Significant Impact" is contained in the Environmental Assessment



## IX. RECOMMENDATIONS

I recommend that the plan selected herein for local flood protection along the Mad River in Waterbury, Connecticut, be authorized for construction as a Federal project, with such modifications as in the discretion of the Chief of Engineers may be advisable, at a first cost presently estimated at \$1,055,000 and with annual operation and maintenance costs estimated at \$2,000.

The city of Waterbury and State of Connecticut would be the non-Federal sponsors of this project and agree that, if the Federal Government shall commence implementation of the Woodtick Local Protection Project, substantially in accordance with the approval of the Chief of Engineers under Section 205 of the 1948 Flood Control Act, as amended the city of Waterbury and the State of Connecticut shall in consideration of the Federal Government commencing said project, fulfill the requirements of non-Federal cooperation, to wit:

1. If found necessary, the city of Waterbury would assume the responsibility for all costs in excess of the Federal cost limitation of \$5,000,000 to insure that expenditure of Federal funds will result in a complete and fully effective project. The Federal cost limitation includes cost of all investigations, planning, engineering, supervision, inspection and administration involved in development and construction.
2. Provide without cost to the United States, all lands, easements, rights-of-way, and utility relocations and bridge modifications necessary for project construction.
3. Hold and save the United States free from damages due to the construction, operation and maintenance of the project, except where such damages are due to the fault of the United States or its contractors.
4. Maintain and operate the project after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army.
5. All aspects of the project, including lands acquired within the flood plain along the Mad River which must be maintained in a manner that prevents future encroachment which might interfere with proper flood plain management and the functioning of the project for flood control consistent with guidance from the National Flood Insurance Program (NFIP).

6. Comply with Title VI of the Civil Rights Act of 1964 (78th Stat. 241) and Department of Defense directive 5500.11 issued pursuant to and published in Part 300 of Title 32, Code of Federal Regulations.


7. Provide an upfront minimum cash contribution of 5% of the total project costs, estimated at \$53,000. Provide an additional cash contribution, currently estimated at \$6,350, to make the non-Federal share equal to 25% of the total project costs, including all lands, easements, rights-of-way, utility relocations and bridge modifications necessary for project construction.

8. Annually inform Woodtick area residents and property owners within the project area of the limitations of the flood control improvements and alert them to the continued threat of floods resulting from greater than the 100-year event.

9. Comply with requirements of non-Federal cooperation specified in Sections 210 and 305 of Public Law 91-646 approved 2 January 1971, entitled: Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the Executive Branch. Accordingly, I acknowledge that the recommendations may be modified before authorization and/or implementation funding.

19 OCT 87  
DATE

  
THOMAS A. RHEN  
Colonel, Corps of Engineers  
Division Engineer

## X. ACKNOWLEDGMENTS

This report was completed by the New England Division Army Corps of Engineers, under the general direction of Colonel Thomas A. Rhen, Division Engineer. It was prepared by Messrs. David Goodrich and Robert Russo, Study Managers, under the supervision of Mr. Peter Jackson, Chief, Project Formulation Section; Mr. William Swaine, Chief, Plan Formulation Branch; and Mr. Joseph Ignazio, Chief, Planning Division.

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Thanks are extended to those who helped prepare this report for publication, especially Ms. Lauren Colt of Plan Formulation Branch. The report was reproduced under the direction of Mr. Bob Bentham.

ENVIRONMENTAL ASSESSMENT  
FINDING OF NO SIGNIFICANT IMPACT  
AND  
404 (B)(1) EVALUATION

LOCAL FLOOD PROTECTION PROJECT  
MAD RIVER  
WATERBURY (WOODTICK AREA), CONNECTICUT

DECEMBER 1985

ERNEST WATERMAN  
GEOLOGIST

NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
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WALTHAM, MASSACHUSETTS  
02254-9149

## Environmental Assessment

- 1.0 Introduction
  - 1.1 Project Purpose
  - 1.2 Project Need
  - 1.3 Project Authority
  - 1.4 Project Area History
- 2.0 Proposed Plan
- 3.0 Alternatives Considered
  - 3.1 No-Action Alternative
  - 3.2 Nonstructural Alternatives
    - 3.2.1 Floodproofing
    - 3.2.2 Relocation
    - 3.2.3 Flood Warning and Evacuation Plan
    - 3.2.4 Land Treatment
    - 3.2.5 Land Use Regulation and Zoning
  - 3.2 Structural Alternatives
    - 3.3.1 Reservoir Storage
    - 3.3.2 Bypasses
    - 3.3.3 Levees and Floodwalls
    - 3.3.4 Channel Modification
- 4.0 Environmental Setting
  - 4.1 Physical Setting
    - 4.1.1 Study Area Location and General Description
    - 4.1.2 Work Site Descriptions
    - 4.1.3 Water Quality
  - 4.2 Biological Resources
    - 4.2.1 Vegetation
    - 4.2.2 Fish and Wildlife
    - 4.2.3 Threatened and Endangered Species
  - 4.3 Socioeconomic Resources
  - 4.4 Archaeological and Historical Resources
- 5.0 Environmental Impacts
  - 5.1 Physical Impacts
  - 5.2 Biological Impacts
  - 5.3 Socioeconomic Impacts
  - 5.4 Archaeological and Historical Impacts
- 6.0 Plan Modifications to Minimize Environmental Consequences
  - 6.1 Construction During the Seasonal Low Flow Period
  - 6.2 Construction of a Low-Flow Channel
  - 6.3 Boulder Placement
  - 6.4 Planting of Streamside Vegetation

7.0 Coordination

8.0 Compliance Table

9.0 References

Pertinent Correspondence

Finding of No Significant Impact

404 (b)(1) Evaluation

## 1.0 Introduction

### 1.1 Project Purpose

The purpose of this proposed local flood control study is to formulate a plan of flood protection which will alleviate the flood damages which currently occur on the Mad River in the Woodtick section of Waterbury, Connecticut.

### 1.2 Project Need

At the present time, major flooding damage to residential property on the Mad River occurs between Sharon and Frost Roads in Waterbury, Connecticut along Woodtick Road, Lund, Bouffard and Glenbrook Avenues. Flooding during March-April 1983 caused considerable flood damage to the Royal Crest Estates, on the right bank of the river, and to 20 residential properties on the left bank. Much of the current flooding problem in the Woodtick area is attributable to flood plain development and filling which occurred in the early seventies and reduced the Mad River's ability to safely discharge flood flows without causing property damage. A plan of action is needed to correct the adverse results of this development.

### 1.3 Project Authority

This project is being accomplished under the special continuing authority contained in Section 205 of the 1948 Flood Control Act. The study was initiated by a request for Federal Assistance by the mayor of the city of Waterbury.

### 1.4 Project Area History

No previous flood control studies have been conducted by the Corps of Engineers in the present study area. A similar local flood protection study is being conducted by the Corps approximately 1 mile downstream of the Woodtick Project Area. This other study is taking place on the Mad River in the vicinity of the Century Brass corporation in Waterbury, Connecticut. This study was initiated at the request of the former Mayor of Waterbury, Edward D. Bergin.

The U.S. Environmental Protection Agency is also conducting a study in the general area of the Corps Flood Control Study. The EPA Study (EPA project number C090214-01) is aimed at the preparation of construction plans and specifications for the Mad River Relief Interceptor which will convey sewage flows from the town of Wolcott's sewerage system to the city of Waterbury's sewerage system. This project extends from above the Sharon Road Bridge to some distance below the Frost Road Bridge and runs mostly on an existing sewage interceptor alignment which follows the general alignment of the Mad River. The EPA's proposed alignment for the relief interceptor intersects the Corps proposed flood control project at Bouffard Avenue and at the Frost Road Bridge. Coordination between the



Corps and EPA is taking place to insure that the two projects do not detrimentally interfere with each other. The EPA relief interceptor project is in a more advanced planning stage than the Corps Flood Control Study and this Environmental Assessment draws upon environmental work done by EPA in the areas where it is applicable to the Corps Project. At this time, EPA is preparing plans and specifications for this sewer project.

In 1974 extensive channel modification work was done in the project area between the Sharon Road Bridge and Bouffard Avenue for an apartment complex. This modification consisted of channel straightening, which removed several small river meanders, and channel widening to 50 feet, from the approximately 20 to 40 foot variable width of the channel which existed at that time. This flood control measure failed to adequately compensate for the exacerbation of flooding conditions caused by the construction of local development projects.

Extensive filling of the Mad River Floodplain occurred in the early seventies. In 1971-1972 a shopping mall, comprising some 60 acres, was constructed on low-lying wetlands on the west bank of the river. The paving of this large area, in addition to the parking areas for several large stores on the opposite side of Wolcott Avenue, concentrated runoff to the river, thereby exacerbating the flooding situation. In 1973, seven large apartment buildings were constructed on the west bank of the river. The filling associated with the construction removed natural flood storage areas and raised the land higher than the opposite bank. On the eastern bank, lesser amounts of floodplain filling has occurred in connection with private residential development. This has also resulted in the loss of natural flood storage areas.

## 2.0 Proposed Plan

The proposed plan involves widening the existing channel along two sections of the Mad River totaling 1270 linear feet which were determined to be the most restricted in this reach. These two areas are located in the vicinity of Frost Road Bridge and opposite Bouffard Avenue (see plate 1). Flood flows in these areas are restricted as a result of encroachment by adjacent property owners and the accumulation of silt and debris. The proposed channel would have a 50 foot bottom width and 2 horizontal on 1 vertical side slope. Riprap and concrete double wall would be used to protect bridge abutments, utility crossings, storm drain outlets, and exposed areas of the riverbank from erosion.

In the vicinity of the Frost Road Bridge channel widening would extend from Station 236+00 below the bridge to Station 244+00 above for a total of 800 linear feet.

Retaining walls would be emplaced on the right and left bank from Station 237+00 to Station 238+00. On the left bank the double wall would be flanked on the upstream and downstream ends by stone protection to be emplaced from Station 235+00 to 237+00 and Station 238+00 to 239+00. On

the right bank the double wall would be flanked on the upstream end by stone protection to be emplaced from Station 238+00 to 239+00.

In the vicinity of Bouffard Avenue channel widening would extend from Station 262+00 to Station 266+50 for a total of 450 linear feet. Stone protection would be emplaced on the left bank from Station 262+00 to Station 266+00 and as much as 200 linear feet of double wall may be placed at Station 265+50 to protect a private residence if needed.

### 3.0 Alternatives Considered

#### 3.1 No Action Alternative

The no action alternative would result in a continuation of the present conditions in the project area and flooding damages to commercial and residential properties would continue to occur unabated. On the other hand, the loss of small areas of terrestrial riparian habitat and other project implementation impacts would be avoided under the no action alternative. It is the opinion of the Corps that the benefits of flood control to the community of the proposed flood control project outweigh the generally minor environmental impacts of project implementation and that there is a demonstrable need for flood control in the project area. For these reasons the no action alternative, which does not answer the need for flood control, was not considered to be a viable option.

#### 3.2 Nonstructural Alternatives

##### 3.2.1 Floodproofing

Flood damage surveys have identified a total of 52 flood prone structures in the Woodtick area. The cost to floodproof this number of structures would far exceed the cost of structural flood control measures. In addition, one of the objectives of this study is to eliminate and/or reduce flooding in the area. Floodproofing can not accomplish this objective. Individual residences will also be introduced to the risk of isolation during flood periods. For these reasons floodproofing does not appear to be a viable flood damage reduction alternative.

##### 3.2.2 Relocation

Relocation of the 52 flood prone structures in the project area would incur a prohibitive project cost. It is estimated that the cost of the acquisition and relocation of just one Royal Crest Apartment Building would exceed the entire cost of the proposed channel modification plan. Also, although not studied it is apparent that the acquisition and relocation of 52 structures housing 472 dwelling units would create social impacts and potential environmental impacts which are much greater in magnitude than those associated with the proposed plan. For these reasons, this alternative was considered to be nonviable and dropped from further consideration.

### 3.2.3 Flood Warning and Evacuation Plan

A flood warning and evacuation plan would involve the institution of a system for the early detection of flooding events and the relay of an early warning to residents of floodprone areas of the Mad River to allow them time to evacuate. Such a system, while clearly feasible, would not meet the objective of reducing flood damages in the project area. Most flood damages currently occurring in the project area are attributable to structural damage to buildings and so would continue to occur despite a flood warning system. This alternative was considered to be nonviable, because it fails to meet the planning objectives and was dropped from further consideration.

### 3.2.4 Land Treatment

Although adopted primarily to further good agriculture and forestry practices, land treatment and watershed management measures have beneficial effects on flood conditions. Modifying or preserving vegetation cover conserves water by increasing infiltration and reducing surface runoff. In general, land treatment usually does not reduce floodstages significantly, but does contribute to preventing their future increase. Treatment of the developed land in the Mad River Basin would have a limited effect on reducing flooding in the Woodtick area. This alternative was, therefore, eliminated from further consideration. Use of this measure by other public and private interests would, however, improve and protect upstream agricultural and forest lands and prevent flood stages from increasing as development occurs.

### 3.2.5 Land Use Regulation and Zoning

The city of Waterbury joined the regular phase of the National Flood Insurance Program on 1 November 1979. As a condition of participation in the regular phase, the city has adopted management regulations which limit construction within the 100-year flood plain (an event having an estimated 1 percent annual chance of occurrence). This will restrict future construction in flood prone areas of the basin and should help to prevent flood conditions in the Woodtick area from worsening. Land use regulation and zoning would, however, have little or no effect on reducing existing flood stages and was not selected for additional investigation.

## 3.3 Structural Alternatives

### 3.3.1 Reservoir Storage

One site investigated for possible upstream flood control storage was Scoville Reservoir located in Wolcott, Connecticut about 1.5 miles upstream of the Woodtick area. The surface area of Scoville Reservoir is 130 acres at a spillway crest elevation of 525 feet NGVD. Increasing the height of the dam by 10 feet would provide about 1,600 acre-feet of flood storage capacity, which is equivalent to about 3.5 inches of runoff from

its 8.5 square mile drainage area. It is estimated that modification of Scoville Reservoir, which would require extensive road relocation and levee construction, would only reduce downstream flood flows by approximately 20 percent. Based on this cursory analysis, upstream storage was found to be a nonviable flood control alternative and dropped from further consideration.

### 3.3.2 Bypasses

A method of modifying floodflows before they reach the Woodtick area would be to divert excessive flow around the area. Preliminary studies indicated that a surface bypass would not be feasible due to the dense development in the study area. The cost to construct a tunnel diversion to divert flood flows around the Woodtick area would far exceed expected benefits because of the limited flood losses in the area. In addition, tunnel diversion would be unacceptable to local residents and city officials, due to the adverse environmental impacts associated with tunnel construction and the disruption to the community. Because of the lack of local support, and considering other viable alternatives, diversion measures were eliminated from further study.

### 3.3.3 Levees and Floodwalls

A plan to construct levees and floodwalls along both banks of the Mad River extending from Bouffard Avenue upstream to Sharon Road Bridge was investigated. A total of 3,500 linear feet of levees and floodwalls ranging in height from 4.5 to 7 feet would be required to provide 100-year flood protection. This plan was determined to reduce annual flood losses by about 72 percent. Preliminary estimates indicate that this alternative would cost more than double the cost of the proposed plan and would probably create environmental impacts of equal or greater magnitude than the proposed plan. Construction of levees and floodwalls would restrict visual and pedestrian access to the river and require limited removal of riparian vegetation. This alternative is considered to be marginally justifiable but is a less desirable option than the proposed plan.

### 3.3.4 Channel Modification

In addition to the proposed plan of channel modification a more comprehensive alternative was also considered. This plan involves widening and deepening the entire channel for a distance of about 1 mile, from Sharon Road Bridge to approximately 1,000 feet downstream of Frost Road Bridge. The invert of the existing channel would be lowered an average of 2 feet throughout this reach. The proposed channel would have a 50-foot bottom width and 2 horizontal on 1 vertical side slopes. A 2-foot layer of stone slope protection resting on a 1-foot layer of gravel bedding would be placed around bridge abutments and be required in two areas of limited space near Bouffard Avenue and downstream at Frost Road Bridge, to prevent erosion. This plan would reduce estimated annual flood losses by approximately 82 percent. Preliminary estimates indicate that

this alternative would cost \$645,000 more than the cost of the proposed plan and would have a much greater environmental impact than the proposed plan. This alternative is considered to be economically justifiable and achieves the projects flood control objectives. This alternative is considered to be less desirable than the proposed plan in view of the greater environmental impact it would cause and its smaller net benefits.

#### 4.0 Environmental Setting

##### 4.1 Physical Setting

###### 4.1.1 Study Area Location and General Description

The city of Waterbury is located in west-central Connecticut, about 20 miles north of New Haven, Connecticut and about 25 miles southwest of Hartford, Connecticut. The study area is located along the Mad River between Sharon and Frost Road Bridges. This section of Waterbury is referred to as the Woodtick area and consists primarily of residential development, including several apartment and condominium complexes. There are also some light manufacturing companies and a large retail shopping mall in this reach.

The Mad River originates at Cedar Swamp Pond in Wolcott, Connecticut and flows in an erratic southwesterly course about 11 miles to its confluence with the Naugatuck River in Waterbury. It has a drainage area of 26.4 square miles and a fall of about 640 feet. The basin is quite steep and the lower portion is heavily urbanized.

The Woodtick area is located about 3 miles upstream from the mouth of the Mad River. In the 3,800-foot reach between the Sharon and Frost Road bridges, the river varies in width from 25 to 60 feet and has a flat gradient of about 4 feet per mile. The drainage area at this location is about 17 square miles.

###### 4.1.2 Work Site Descriptions

Frost Road Bridge In the immediate vicinity of Frost Road Bridge the land use is essentially residential. The west bank of the river south of the bridge supports a small apartment complex and has received placement of 10 to 12 feet of fill in the past. The riverbank in this stretch is extremely steep and supports a thin screen of saplings and mature hardwood trees between the apartment complex, which reaches down to the top of the riverbank, and the river itself.

The eastern bank south of the bridge has received lesser amounts of fill (5-6ft) as a result of residential development, for approximately the first 240 feet south of the bridge. This section of the bank is partially retained by a poorly constructed, vertical wall of concrete modular blocks approximately 80 feet long located at the southerly end of this section. This wall is in a state of disrepair and in some sections has partially

fallen down into the water. The remainder of the eastern bank south of the bridge is apparently at its natural elevation and is relatively undisturbed although it is hemmed in by private residences. The section of eastern river bank south of the existing concrete modular wall can be classified as northern overflow forest wetland.

North of the Frost Road Bridge the riverbanks appear to be at approximately their natural elevation although on the eastern bank stone riprap has been placed with possibly some fill placement having occurred behind it. Bands of undisturbed land are present on both banks though they are again closely confined to the sides of the river by residential development.

The river substrate in the Frost Road reach is a sandy, gravelly cobble substrate with numerous boulders present and a scattered occurrence of random trash items (tires, bottles, cans, etc). The substrate is generally coated with a 1/16-1/8" layer of silt and sparse algal growth. Substantial silt deposits are present under and just downstream of the bridge. Canopy cover over the Mad River in this area is 35 to 40% keeping the river well shaded and relatively cool.

Bouffard Avenue In the vicinity of Bouffard Avenue the predominant land use is again residential. The west bank of the river in this reach received substantial fill as a result of the building of the Royal Crest Estates and the steep sloping riverbank thus created was faced over with stone riprap protection. A thin screen of hardwood trees and herbaceous growth exists along most of this reach except at the northerly end where only sparse herbaceous growth occurs.

On the eastern side the riverbank exists at approximately natural elevations within the project area and is predominately covered by an open area of lawn grass with shade trees planted alongside the river. The extreme northern and southern ends of this reach enter into wooded areas of more pristine condition which are restricted to the river corridor. The eastern bank in the Bouffard Avenue reach could all be classified as northern overflow forest wetland.

The river substrate in the Bouffard Avenue reach is a light brown clayey silt to silty sand with silt covered boulders present and moderate amounts of algal growth. The riverbanks, where natural are composed of fine to medium sand with some gravel present. Canopy cover over the Mad River in this area is 15 to 20% such that the river is more exposed to sunlight than in the Frost Road Bridge area.

#### 4.1.3 Water Quality

The Mad River's water quality in the project area is rated by the State of Connecticut as Class B (Karen Haywood, Water Compliance Unit, per comm. 21 Aug 1984). Class B waters are suitable for bathing, other recreational purposes, agricultural uses, certain industrial processes and cooling; they provide excellent fish and wildlife habitat and have good aesthetic value. The quality criteria for class B waters under the state of Connecticut's classification system are shown in Table I.



TABLE I

State of Connecticut  
Water Quality for Class B Waters

<u>Criteria</u>	<u>Standard</u>
1. Dissolved oxygen	not less than 5 mg/L any time.
2. Sludge deposits - solid refuse - floating solids - oil and grease - scum	None except for small amounts that may result from the discharge from a waste treatment facility providing appropriate treatment.
3. Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity or dredge material disposal provided all reasonable controls are used.
4. Color and turbidity	Turbidity shall not exceed 25 JTU; $B_c$ not to exceed 10 JTU over ambient levels. A secchi disc shall be visible at a minimum depth of 1 meter; Class $B_b$ - criteria may be exceeded.
5. Coliform bacteria per 100 ml	Fecal Coliform shall not exceed a log mean of 200 organisms/100ml nor shall 10% of the samples exceed 400 organisms/100 ml.
6. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class nor cause taste and odor in edible fish.

7. pH

6.5 - 8.0

8. Allowable temperature increase

None except where the increase will not exceed the recommended limit on the most sensitive receiving water, use in no case exceed 85°F, or in any case raise the normal temperature of the receiving water more than 4°F.

9. Chemical constituents See General Policy 11.

## 4.2 Biological Resources

### 4.2.1. Vegetation

As noted in the previous sections areas of undisturbed vegetation are present in the project area but narrowly confined to the area of the riverbanks by the residential development characteristic of the project area. The vegetated areas present are densely populated and very diverse containing a wide variety of both native and escaped domestic plant species. Aquatic vegetation is relatively sparse and is composed predominantly of emergent plants along the riverbanks. Table II shows the vegetation found to occur in the Mad River project area.

### 4.2.2 Fish and Wildlife

Invertebrates: It was noted during a field investigation conducted by Corps personnel on 24 July 1985 that the project area was populated by numerous dragonflies (Odonata) and abundant other terrestrial and aquatic insects. Crayfish (Decapoda) were also noted in the river. The U.S. Fish and Wildlife conducted a field investigation of the project area on 11 October 1984. Limited benthic sampling performed on this occasion revealed a substantial population of Caddis Fly (Trichoptera) larva (Gordon Beckett, USFWS, Planning Aid Letter, 15 Nov. 1984).

Fisheries: Fish species found in the project area include Suckers (Catostomidae), Blacknose Dace (Rhinichthys atratulus), sunfish (Centrarchidae) and possibly some Eels (Anquilla rostrata).

Brown Trout (Salmo trutta) and Brook Trout (Salvelinus fontinalis) are stocked upstream of the project area and native Brook Trout are found here also. Some trout are found as far downstream as the Woodtick Project area which experiences minor usage as a recreational fishery for this reason (Robert Orciari, CT. Fisheries Unit, per. comm. 21 Aug 1984).

The U.S. Fish and Wildlife Service during their 11 October 1984 field investigation noted the presence of White Suckers (Catostomus commersoni), Blacknose Dace (Rhinichthys atratulus) and various minnows (Gordon Beckett, USFWS, planning aid letter 15 Nov 1984).

Birds: Bird species noted in the project during a 24 July 1985 field investigation include Mockingbirds, Blue Jays, Robins, House Sparrows, Common Grackles, Cardinals, American Gold Finches, and Song Sparrows. All of the bird species observed may be nesting in the project area which provides excellent songbird habitat. Tracks of wading birds were also observed in the project area in the vicinity of Bouffard Avenue and it is apparent that at least some wading birds use the Mad River as a feeding ground.

TABLE II

Flora of the Mad River Woodtick Project Area  
24 July 1985 Field Investigation

Common Name	Scientific Name	Widespread	Common	Sparse
<b>Trees &amp; Shrubs</b>				
Balsam Fir	<u>Abies balsamea</u>			x
Black Birch	<u>Betula lenta</u>	x		
Black Cherry	<u>Prunus serotina</u>			x
Blue Spruce	<u>Picea pungens</u>			x
Choke Cherry	<u>Prunus virginiana</u>			x
Dogwood	<u>Cornus sp.</u>	x		
Eastern Cottonwood	<u>Populus deltoides</u>		x	
Eastern Hemlock	<u>Tsuga canadensis</u>			x
Forsythia	<u>Forsythia sp.</u>			x
Grey Birch	<u>Betula populifolia</u>	x		
Hydrangea (cultivated)	<u>Hydrangea sp</u>			x
Japanese Barberry	<u>Berberis thunbergii</u>		x	
Multiflora Rose	<u>Rosa Multiflora</u>			x
Northern Catalpa	<u>Catalpa speciosa</u>		x	
Red Maple	<u>Acer rubrum</u>	x		
Red Oak	<u>Quercus rubra</u>		x	
Silver Maple	<u>Acer saccharinum</u>	x		
Speckled Alder	<u>Alnus rugosa</u>	x		
Staghorn Sumac	<u>Rhus typhina</u>	x		
Sugar Maple	<u>Acer saccharum</u>	x		
White Oak	<u>Quercus alba</u>			x
Wild Grape	<u>Vitis sp.</u>	x		
Wisteria	<u>Wisteria sp.</u>			x
<b>Ferns and Allies</b>				
Bracken	<u>Pteridium aquilinum</u>		x	
Horsetail	<u>Equisetum sp.</u>	x		
Interrupted Fern	<u>Osmunda claytoniana</u>			x
Lady Fern	<u>Athyrium Filix - femina</u>	x		
New York Fern	<u>Thelypteris noveboracensis</u>	x		
Sensitive Fern	<u>Onoclea sensibilis</u>		x	
Spinulose Woodfern	<u>Dryopteris spinulosa</u>		x	
<b>Herbaceous Species</b>				
American Brookline	<u>Veronica americana</u>			x
Arrowleafed Tearthumb	<u>Polygonum sagittatum</u>			x
Asiatic Dayflower	<u>Commelina communis</u>			x
Bedstraw	<u>Galium sp.</u>	x		
Beggar's Ticks	<u>Bidens sp.</u>		x	

Bittersweet Nightshade	<u>Solanum dulcamara</u>	x	
Blue Vervain	<u>Verbena hastata</u>		x
Boneset	<u>Eupatorium perfoliatum</u>		x
Branching Bur Reed	<u>Sparaganium androcladium</u>	x	
Burdock	<u>Arctium minus</u>		x
Butter and Eggs	<u>Linaria vulgaris</u>		x
Cinquefoil	<u>Potentilla sp. .</u>	x	
Clearweed	<u>Pilea pumila</u>		x
Common Arrowhead	<u>Sagittaria latifolia</u>		x
Common Greenbrier	<u>Smilax rotundifolia</u>		x
Common Milkweed	<u>Asclepias syriaca</u>		x
Common Plantain	<u>Plantago major</u>		x
Curled Dock	<u>Rumex crispus</u>		x
Everlasting	<u>Gnaphalium sp.</u>		x
False Nettle	<u>Boehmeria cylindrica</u>		x
Fringed Loosestrife	<u>Lysimachia ciliata</u>		x
Gill-Over-The-Ground	<u>Glechoma hederacea</u>	x	
Goldenrod	<u>Solidago sp.</u>		x
Japanese Knotweed	<u>Polygonum cuspidatum</u>	x	
Joe Pye Weed(?)	<u>Eupatorium sp.</u>		x
Lady's Thumb	<u>Polygonum persicaria</u>		x
Meadowsweet	<u>Spirea latifolia</u>		x
Monkey-Flower	<u>Mimulus sp</u>		x
Pickernelweed	<u>Pontederia cordata</u>		x
Poison Ivy	<u>Rhus radicans</u>		x
Pokeberry	<u>Phytolacca americana</u>		x
Queen Anne's Lace	<u>Daucus carota</u>		x
Quickweed	<u>Galinsoga parviflora</u>		x
Ragweed	<u>Ambrosia artemisiifolia</u>	x	
Raspberry	<u>Rubus idaens</u>		x
Round leaved violet	<u>Viola rotundifolia</u>		x
Skunk cabbage	<u>Symplocarpus foetidus</u>		x
Small White-Flowered Aster	<u>Aster sp.</u>	x	
Smooth Yellow Violet	<u>Viola pennsylvanica</u>		x
Spotted Joe Pye Weed	<u>Eupatorium maculatum</u>		x
Spotted Touch-Me-Not	<u>Impatiens capensis</u>	x	
St. Johnswort	<u>Hypericum perforatum</u>		x
Tall Blue Lettuce	<u>Lactuca biennis</u>		x
Tall Meadow Rue	<u>Thalictrum ploygammum</u>		x
Trumpetweed	<u>Eupatorium fistulosum</u>		x
Umbrella Sedge	<u>Cyperus diandrus</u>		x
Water Horehound	<u>Lycopus americanus</u>		x
Wild Peppergrass	<u>Lepidum virginicum</u>		x
Woodbine	<u>Parthenocissus quinquefolia</u>	x	
Wood Nettle	<u>Laportea canadensis</u>	x	
Yarrow	<u>Achillea millefolium</u>		x
Yellow Wood Sorrel	<u>Oxalis europaea</u>	x	

Mammals: During the 24 July 1985 field investigation by Corps personnel Muskrats (Ondatra zibethica) and Eastern Chipmunks (Tamias striatus) were sighted in the project area. Signs of Raccoons (Procyon lotor) and Norway Rats (Rattus norvegicus) were also noted in the project area.

The U.S. Fish and Wildlife Service on their 11 October 1984 field investigation noted signs of Raccoons (P. lotor), Muskrats (O. zibethica) and Mink (Mustela vison) (Gordon Beckett, USFWS planning aid letter 15 Nov 1984).

#### 4.2.3 Threatened and Endangered Species

There are no known threatened or endangered species of plants or animals or their critical habitat present in the project area except for occasional transient individuals. (Gordon Beckett, USFWS Letter 15 Nov 1984).

#### 4.3 Socio-Economic Resources

As previously noted the project area is predominantly residential in character with some commercial and industrial development located near the northern end of the project area. Most of the land adjacent to the river in this area is in private ownership with little opportunity for public access. Where access does exist, the Mad River receives minor usage as a recreational fishery.

#### 4.4 Archaeological and Historical Resources

The potential for archaeological resources in the project area is non-existent due to the severe land modification which occurred during the construction of the Royal Crest Apartments, Naugatuck Mall, Frost Road Apartments, and parking lots, earlier slope protection measures, and the installation of a previous sewer line by the U.S. Environmental Protection Agency. All structures in the project vicinity were built in the 20th century.

### 5.0 Environmental Impacts

#### 5.1 Physical Impacts

Construction of the proposed flood control project will result in a range of minor, short-term impacts lasting only for the duration of actual project construction operations. Construction equipment operating in the project area will generate minor amounts of dust and noise which will create some disturbance to homeowners and apartment dwellers in areas adjacent to the work areas. Channel widening operations may also generate minor amounts of turbidity and sedimentation in the Mad River, though conducting construction during the period of seasonal low flow will minimize this impact. The resulting impact to water quality as a result of turbidity will be negligible.

The contractor's vehicles accessing the site to bring in construction equipment and materials may create some disturbance to traffic patterns in residential areas adjacent to work areas which do not normally receive usage by heavy trucks. These areas appear, however, to already receive moderately heavy usage by general vehicular traffic and the contractor's vehicles accessing the site would not noticeably increase the volume of traffic utilizing most of the roads in the vicinity of the project area.

All of the impacts discussed above, except for potential minor instream sedimentation, will last only for the duration of project construction. These impacts are unavoidable but will be minor in nature and localized to the immediate work areas.

Construction of the proposed project will also result in a range of long term impacts. Channel widening will result in the removal of approximately 0.17 acres of mixed upland and northern overflow forest stream bank habitat in the Bouffard Avenue area due to actual channel widening plus the disturbance and alteration of another 0.32 acres due to bank grading and placement of stone protection. In the Frost Road Bridge area channel widening will result in the removal of 0.48 acres of mixed upland and northern overflow forest plus the disturbance and alteration of another 0.38 acres of similar habitat.

The placement of stone protection and concrete double walls on the banks of the widened channel will interfere with access to the stream for small mammals due to the physical barrier posed by these structures and the lack of natural cover in the area of these structures. These structures will also interfere with passage of wildlife up and down the Mad River corridor for the same reasons.

Channel widening and the consequent removal of vegetation will result in loss of canopy cover over the water in the work area. The resulting increase in exposure of the water to sunlight will result in a warming of water temperature in these areas with a subsequent slight degradation of the aquatic habitat. Because the size of the areas involved is relatively small (450 linear feet of stream habitat at Bouffard Avenue and 800 linear feet at Frost Road) the incremental effect on the overall quality of total aquatic habitat available in the Mad River is anticipated to be negligible.

## 5.2 Biological Impacts

In the short term, construction operations are likely to induce all wildlife which utilize the work areas to avoid these areas at least during the hours when construction crews are present on the site. In addition, any attempt at nesting activities in the immediate vicinity of the work area are likely to be prevented by the disturbance construction operations will present to these areas. Potential instream turbidity during the project operations is likely to cause fish to also avoid work areas during the period of project construction.



Over the long term, project construction will result, at a maximum, in the loss or alteration of 1.35 acres of mixed upland and northern overflow forest habitat about 1/2 to 3/4 of which is relatively pristine in condition and provides high quality habitat for songbirds and small mammals. There will be a corresponding loss of natural vegetation in these areas.

The placement of stone protection and concrete double walls will interfere with, but not totally prevent, wildlife access to the banks of the Mad River and up and down the Mad River corridor in the vicinity of Bouffard Avenue and the Frost Road Bridge these factors will result in a slight decrease in wildlife usage of the immediate project area but will not result in a significant decrease of the wildlife usage of the Mad River corridor.

The 800 and 450 foot long, widened channel sections would maintain only marginal fishery habitat due to the reduction of canopy cover over the channel and the creation of a flat, uniform, featureless bottom over the widened portions of the channel outside the confines of the existing channel. The construction of a low flow channel (see Section 6.0) would insure unrestricted fish passage upstream and downstream of the project area and maintain the quality and integrity of the fishery resources in the Mad River as a whole. The incremental impact of aquatic habitat degradation within the short widened channel reaches would be a negligible impact to the overall fisheries resource and fishery habitat of the project area.

### 5.3 Socio/Economic Impacts

As was noted in section 5.1 construction operations will generate noise in the project area in the immediate areas of actual work. This will create an impact to adjacent homeowners and apartment dwellers for the duration of construction operations.

As was also noted traffic impacts will be generated during the construction phase in the form of truck traffic which is uncharacteristic of the local area although overall traffic volumes will not be noticeably increased.

In the long term few social impacts will be caused by the proposed project. Public access into the project area will remain the same both before and after the project's construction and the area's utilization as a recreational fishery will be unimpaired. The visual aesthetic value of the area will be changed because the removal of natural vegetation and channelization of the 1270 foot reach. The project will require the taking of approximately 1.35 acres of privately owned land but will not require the taking or relocating of any residences.

#### 5.4 Archaeological and Historical Impacts

Severe land disturbance by prior private construction and recent installation of a sewer line indicates that significant prehistoric or historic archaeological resources are extremely unlikely within the project impact area. Furthermore, all structures in the project vicinity are modern. Therefore, no effects are anticipated upon significant archaeological or historical resources as a result of the proposed project. A letter from the State Historical Preservation Office confirms this finding (Dawn Maddox, CT Deputy State Historic Preservation Officer, Letter, 22 Nov 1985).

#### 6.0 Plan Modifications to Minimize Environmental Consequences

##### 6.1 Construction During the Seasonal Low - Flow Period

Project construction has been scheduled during the period of seasonal low-flow on the Mad River. This has been tentatively identified at being the period from 1 July to 30 November. Additional hydrological information is needed, and will be obtained, to confirm this finding.

Constructing the project during the period of seasonal low flow will minimize the potential for streambank erosion and the occurrence of instream turbidity and instream sedimentation during construction.

##### 6.2 Construction of a Low - Flow Channel

The project plans have been modified to incorporate the construction of a low flow channel at the recommendation of the Connecticut Department of Environmental Protection's Fisheries Unit (Robert Orciari: CT fisheries Unit, per comm. 26 Nov 1985). This low flow channel would be constructed by first widening the existing channel to a width of 35 feet. Then, the invert of the widened channel would be stepped up 1 foot and channel widening completed to the designed 50 foot overall channel width at this new elevation. Note that no channel deepening would be required to establish the low flow channel. This measure would provide an average water depth of 9" in the 35 foot wide channel during the seasonal low flow period from July to October.

This plan modification will preserve unrestricted fish passage upstream and downstream of the project area and hence preserve the fisheries habitat value and fisheries resources of the Mad River while still providing a widened flood control channel capable of transmitting anticipated flood flows.

##### 6.3 Boulder Placement

After channel widening is complete, boulders will be placed in the widened channel in coordination with the Connecticut DEP. These boulders will provide cover for aquatic animals and replace some microhabitat

removed by the channelization. This measure will help to protect the fishery resource and preserve the quality of aquatic habitat.

#### 6.4 Planting of Streamside Vegetation

To offset the loss of streamside vegetation due to channel widening plantings of high value wildlife plants have been incorporated into the project design. Species such as spicebush (Lindera benzoin), speckled alder (Alnus rugosa), sweet pepperbush (Clethra alnifolia), highbush blueberry (Vaccinium corymbosum) and shrub willow (Salix sp.) will be planted along the top of each bank in appropriate areas to serve as food and cover for wildlife species as well as provide some stream shading.

#### 7.0 Coordination

The following Federal and State agencies were coordinated with in the development of this environmental assessment.

##### Federal

1. National Marine Fisheries Service  
Habitat Protection Branch  
212 Rogers Avenue  
Milford, Connecticut 06460
2. U.S. Environmental Protection Agency - Region 1  
JFK Building  
Boston, Massachusetts 02203
3. U.S. Fish and Wildlife Service  
Ecological Service  
P.O. Box 1518  
Concord, New Hampshire 03301

##### State

4. Connecticut Department of Environmental Protection  
State Office Building  
Hartford, Connecticut 06115
5. Connecticut State Historic Preservation Office  
59 South Prospect Street  
Hartford, Connecticut 06106

COMPLIANCE WITH ENVIRONMENTAL FEDERAL STATUTES AND EXECUTIVE ORDERS

1. Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq

Compliance: Consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation concerning mitigation of historic and/or archaeological resources signifies compliance.

2. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Submission of this report to the Regional Administrator of the Environmental Protection Agency for review pursuant to Sections 176c and 309 of the Clean Air Act signifies partial compliance.

3. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review have been incorporated into this report. An application shall be filed for State Water Quality Certification pursuant to Section 401 of the Clean Water Act.

4. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.

Compliance: Not Applicable; project is not located within the State designated coastal zone.

5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) has yielded no formal consultation requirements pursuant to Section 7 of the Endangered Species Act.

6. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Not Applicable; this report is not being submitted to Congress.

7. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Coordination with the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

8. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the FWS, NMFS and RI Department of Environmental Management<sup>1</sup> signifies compliance with the Fish and Wildlife Coordination Act.

9. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Submission of this report to the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

10. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not Applicable; project does not involve the transportation nor disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

11. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: Coordination with the State Historic Preservation Office determined that no historic or archaeological resources would be affected by the proposed project.

12. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 432 et seq.

Compliance: Preparation of this report signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

13. Rivers and Harbors Appropriation Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for Corps projects or programs authorized by Congress. The proposed beach erosion control project is pursuant to the Congressionally-approved continuing authority program; i.e. Section 103 of the River and Harbor Act of 1962.<sup>2</sup>

<sup>1</sup>Include applicable State fish and wildlife agency

<sup>2</sup> Include applicable type of project and appropriate authority

14. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Compliance: No requirements for Corps activities.

15. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Compliance: Coordination with the regional office of the NPS and incorporation of consultation results into this report signifies compliance with this Act.

#### Executive Orders

1. Executive Order 11988, Floodplain Management, 24 May 1977 as amended by Executive Order 12148, 20 July 1979.

Compliance: Circulation of this report for public review fulfills the requirements of Executive Order 11988, Section 2(a)(2).

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: Circulation of this report for public review fulfills the requirements of Executive Order 11990, Section 2(b).

3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not Applicable; project is located within the United States.

#### Executive Memorandum

1. Analysis of Impacts of Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not Applicable; project does not involve nor impact agricultural lands.

## 9.0 References

1. Beach, D., National Marine Fisheries Service, per. comm., 23 October 1985.
2. Beckett, G. U.S. Fish and Wildlife Service, Planning Aid Letter, 15 November 1985.
3. Beckett, G. U.S. Fish and Wildlife Service, Letter, 15 November 1985.
4. Connecticut Department of Environmental Protection, 1980. Connecticut Water Quality Standards & Criteria, Water Compliance Unit, Hartford Connecticut.
5. Haywood, K., CT. Water Compliance Unit, per. comm., 21 August 1984.
6. Maddox, D., State Historic Preservation Office, Letter, 22 November 1985.
7. Orciari, R., CT. Fisheries Unit, per. comm., 21 August 1984.
8. Orciari, R., CT. Fisheries Unit, per. comm., 26 November 1985.

Pertinent Correspondence



Office of the  
STATE  
HISTORIC  
PRESERVATION  
OFFICER  
for Connecticut

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59 SOUTH PROSPECT STREET • HARTFORD, CONNECTICUT 06106 • 203 566-3005

November 22, 1985

Mr. Joseph L. Ignazio  
Chief, Planning Division  
Department of the Army  
New England Division, Corps of Engineers  
424 Trapelo Road  
Waltham, MA 02254

SUBJECT: Mad River, Waterbury, CT

Dear Mr. Ignazio:

The State Historic Preservation Office has reviewed the above-named project. In the opinion of the State Historic Preservation Office, this project will have no effect on historical, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

This office appreciates the opportunity to have reviewed and commented upon this project.

For further information, please contact David A. Poirier, Archaeologist.

Sincerely,



Dawn Maddox  
Deputy State Historic  
Preservation Officer

DAP/PW

Rev. 4/85



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES  
P.O. BOX 1518  
CONCORD, NEW HAMPSHIRE 03301

NOV 15 1985

Mr. Joseph L. Ignazio  
Chief, Planning Division  
U.S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254

Dear Mr. Ignazio:

This responds to your October 24, 1985 request for information on the presence of Federally listed and proposed endangered or threatened species in conjunction with the proposed Section 205 Local Flood Protection Project, located on the Mad River in Waterbury, Connecticut.

Our review shows that except for occasional transient individuals, no Federally listed or proposed species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further consultation is required with us under Section 7 of the Endangered Species Act. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to endangered species under our jurisdiction. It does not address other legislation or our concerns under the Fish and Wildlife Coordination Act.

A list of Federally designated endangered and threatened species in Connecticut is enclosed for your information. Thank you for your cooperation and please contact us if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett  
Supervisor  
New England Area

Enclosure

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES  
IN CONNECTICUT

Common Name	Scientific Name	Status	Distribution
<u>FISHES:</u>			
Sturgeon, shortnose*	<u>Acipenser brevirostrum</u>	E	Connecticut River and Atlantic Coastal waters
<u>REPTILES:</u>			
Turtle, green*	<u>Chelonia mydas</u>	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	<u>Eretmochelys imbricata</u>	E	Oceanic straggler in Southern New England
Turtle, leatherback*	<u>Dermochelys coriacea</u>	E	Oceanic summer resident
Turtle, loggerhead*	<u>Caretta caretta</u>	T	Oceanic summer resident
Turtle, Atlantic ridley*	<u>Lepidochelys kempii</u>	E	Oceanic summer resident
<u>BIRDS:</u>			
Eagle, bald	<u>Haliaeetus leucocephalus</u>	E	Entire state
Falcon, American peregrine	<u>Falco peregrinus anatum</u>	E	Entire state - re-establishment to former breeding range in progress
Falcon, Arctic peregrine	<u>Falco peregrinus tundrius</u>	E	Entire state Migratory - no nesting
<u>MAMMALS:</u>			
Cougar, eastern	<u>Felis concolor cougar</u>	E	Entire state - may be extinct
Whale, blue*	<u>Balaenoptera musculus</u>	E	Oceanic
Whale, finback*	<u>Balaenoptera physalus</u>	E	Oceanic
Whale, humpback*	<u>Megaptera novaeangliae</u>	E	Oceanic
Whale, right*	<u>Eubalaena</u> spp. (all species)	E	Oceanic
Whale, sei*	<u>Balaenoptera borealis</u>	E	Oceanic
Whale, sperm*	<u>Physeter catodon</u>	E	Oceanic
<u>MOLLUSKS:</u>			
NONE			
<u>PLANTS:</u>			
Small Whorled Pogonia	<u>Isotria medeoloides</u>	E	Hartford, New Haven, Fairfield, New London, Windham, Tolland, Litchfield Counties

\* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES  
P.O. BOX 1518  
CONCORD, NEW HAMPSHIRE 03301

Colonel Carl B. Sciple  
Division Engineer  
New England Division  
U. S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254

NOV 15 1984

Dear Colonel Sciple:

This Planning Aid Letter is intended to aid your study planning efforts for the development of local flood protection measures along the Mad River, Waterbury, Connecticut. It has been prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Your November 1983 Reconnaissance Report discussed a wide range of flood damage reduction alternatives for these separate reaches along the Mad River; Woodtick, Century Brass Corporation, and Fleisher Finishing Corporation. We understand that floodproofing was found not feasible due to the number of buildings involved, their age, and the extensive structural modification required. Upstream reservoir storage was deemed to have little impact upon flood modification and did not appear to be a useful flood control alternative. The most probable plan for flood damage reduction includes diversion of flood flows and channelization of flood flows. Specific alternatives/measures for each of the three damage reaches are as follows:

Woodtick (Alternatives reduced to three channel improvement projects)

1. Widen channel to 70 feet (current width varies from 25 to 60 feet) in the 3,800-foot reach between Sharon and Frost Roads. The channel invert would be lowered one foot, exposed shorelines riprapped, and the sharp bend near Glenbrook Avenue eliminated. Low areas along the right bank would require diking.
2. Straighten the sharp bend in the river channel near Glenbrook Avenue and remove silt deposits adjacent to the Naugatuck Valley Mall parking area.
3. Construct flood walls and/or dikes to protect the Royal Crest Estates and houses along Woodtick Road. Requires interior drainage system at Royal Crest Estates. On the east side of the river two houses would have to be either physically raised, or relocated from the floodplain.

Century Brass Corporation

Diversion of Flood Flows:

1. Construct a deep rock diversion tunnel from just upstream of Route 69 to the Naugatuck River.
2. Construct a conduit in the old railroad bed and/or existing water supply canal to divert flood flows from just upstream of Route 69 through the Century Brass Corporation property to the Mad River immediately downstream of Route 84.

Channelization of Flood Flows (The following measures are included as one alternative):

1. A 30-foot wide by 10-foot high box conduit, 200 feet in length, extending from Building 46 upstream to beyond Hamilton Avenue.
2. A 1,500-foot long "I" type floodwall on the left bank extending from Hamilton Avenue upstream to the John Dee Dam.
3. Lower John Dee Dam by 4 feet and install a 4 x 70-foot bascule gate.
4. An earth dike (7 feet high and 200 feet long) upstream to Route 69 to prevent flood flows from passing down the old railroad bed.

Fleisher Finishing Corporation

Diversion of Flood Flows:

1. Deep rock diversion tunnel as for Century Brass.

Channelization of Flood Flows:

1. Lower the dam located 900 feet downstream of Fleisher Finishing by 6 feet, install a 6 x 80-foot bascule gate on the dam and widen the river to 70 feet between the dam and the Fleisher buildings.

2. Construct a 600-foot long "T" type flood wall, maximum height of 13 feet, on the right river bank adjacent to the Fleisher buildings. An interior drainage system would be required.

A field investigation of the project area was conducted on October 11, 1984, by personnel of this Service. The Mad River in the Woodtick area, Sharon to Frost Roads, still retains significant fish and wildlife resource values despite a history of virtually uncontrolled development of the floodplain area. At the time of our site visit, we observed new residential construction in progress in the floodplain across the river from Royal Crest Estates. The riparian vegetation from Frost Road to the end of the Naugatuck Valley Mall parking lot consists of a narrow though dense band of trees, shrubs and various forbes and grasses. Some of the more obvious vegetation includes red maple, gray birch, cottonwood, willow (spp), crab apple, choke cherry, red oak, speckled alder, silky dogwood, smooth sumac, grape and Japanese knotweed. From the end of the "Mall" upstream to Sharon Road the streamside vegetation changes dramatically. Approximately 1,000 feet of meandering stream channel in this area was straightened in conjunction with the construction of Royal Crest Estates. On the west bank, lawns of the Royal Crest Estates extend nearly to the water's edge leaving a very narrow band of various herbaceous vegetation. It appears that an effort is made to discourage establishment of woody vegetation in this area. The east bank, due to housing developments, is a mosaic of lawns and natural floodplain vegetation. Overall, the amount of riparian vegetation that remains in this entire reach is quite limited, however, it does provide excellent habitat for small mammals and a large variety of songbirds.

The Mad River in this area has a predominantly gravel-cobble substrate, however, in some areas silt deposits were obvious. These silt deposits are of recent origin and are due to run-off from disturbed areas in the watershed. The water was relatively clear and water quality appeared to be good. Limited benthic sampling revealed a substantial population of caddis larva. White suckers, blacknose dace and various minnows were noted in the stream and signs of raccoon, muskrat, and mink were noted along the shore. Although the Mad River in this section has been degraded to some extent by silt deposits and channelization in the area of Royal Crest Estates it still supports a very modest population of wild brook trout.

Our field investigation of the Mad River on the property of Century Brass was severely limited due to the company's refusal to grant us access. However, the river was viewed from Hamilton Avenue, Route 69 and at a point off of East Main Street. It appears that for the most part, the river is bordered by retaining walls and close-set buildings and has little streambank cover outside of a very narrow intermittent strip of red maple saplings, Japanese knotweed and various herbaceous plants at the base of the retaining wall. The river has a grayish appearance and the gravel-cobble substrate was coated with a gray-brown substance. No fish life was observed and limited benthic sampling off of East Main Street revealed that the stones were devoid of invertebrates.

The Mad River in the vicinity of Fleisher Finishing Corporation had a gray wash water color with a definite scum on the water surface. No fish life or benthic invertebrates were observed. The Fleisher buildings abut the water's edge and streambank vegetation was very sparse in this area. However, downstream in the vicinity of the dam the river has steep embankments that are well vegetated with trees, shrubs, and herbaceous plants. Some of the more prevalent species include black locust, cottonwood, tree-of-heaven, apple, black cherry, red maple, red oak, gray birch, grape and bittersweet. This riparian vegetation affords excellent habitat for small mammals and a large variety of songbirds. Outside of this streamside vegetation there is minimal wildlife habitat available in this heavily urbanized, industrial area.

Widening and deepening the Mad River, from Frost to Sharon Roads, would remove much of the riparian vegetation utilized by wildlife and would destroy the habitat supporting the local wild brook trout population. We cannot support channel widening and removal of riparian vegetation in this area. In lieu of channel widening, we can support a combination of the following measures: (1) floodwalls and/or dikes that do not destroy existing riparian vegetation, (2) floodproofing, including the raising of houses, (3) relocation of houses to areas outside the floodplain, (4) flood insurance, and (5) control of the siltation problem at its source.

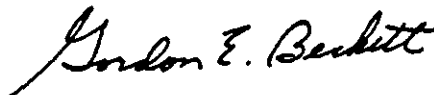
Based on our limited investigation of the Mad River in the area of Century Brass, we do not anticipate significant adverse impacts upon fish and wildlife resources from either the diversion of flood flows or the channel improvement plan. However, we believe that the deep rock diversion tunnel should be rigorously evaluated since it would appear to solve the flood problem throughout the lower Mad River watershed.

Widening the Mad River downstream of the Fleisher Finishing Corporation would largely remove the last vestige of wildlife habitat in this heavily developed urban and industrialized area. We cannot support channel widening and removal of riparian vegetation in this area. However, the 600-foot "T" type flood wall adjacent to the Fleisher buildings would remove a minimal amount of streamside cover and would be the preferred alternative from a fish and wildlife viewpoint.

To more accurately assess the impacts of this proposal project, the following information will need to be developed during the flood control planning process: (1) a refined analysis of all potential structural and non-structural measures, (2) an analysis of bottom sediments in the proposed dredging areas for toxic substances, and (3) the location of potential disposal areas for dredged material.

We are available to provide assistance during the remaining stages of project planning, and will report on the potential impacts of your selected plan.

Sincerely yours,

A handwritten signature in cursive script that reads "Gordon E. Beckett".

Gordon E. Beckett  
Supervisor  
New England Field Office



Finding of No Significant Impact

## FINDING OF NO SIGNIFICANT IMPACT

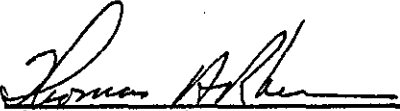
The proposed Local Flood Control Project on the Mad River in Waterbury, Connecticut will provide for channel widening to 50 feet from a current 20 to 50 feet, along 900 linear feet of the channel of the Mad River and for placement of stone protection and concrete double walls to stabilize and protect the banks of the widened channel. This channel widening will increase the project area's ability to safely discharge flood flow over a problem area approximately 1 mile in length between Sharon and Frost Roads in Waterbury, Connecticut. Estimated annual flooding damages in this area are anticipated to be reduced by 67% as a result of project construction.

Evaluation of the project site and planned construction activity indicates that there should be no unacceptable environmental impacts. This assessment has been prepared in accordance with the National Environmental Policy Act of 1969 and appropriate environmental laws and regulations. The determination that an Environmental Impact Statement is not required is based on the information contained in the Environmental Assessment and the following considerations:

- a) The proposed plan would not affect any threatened or endangered species of plants or animals or their critical habitat.
- b) The proposed plan would not affect any cultural resources.
- c) The proposed plan would not cause any significant social impact. Noise and traffic impact caused by project construction would be short term and localized in nature.
- d) The 1.35 acres of combined upland and northern outflow forest streambank habitat which would be lost as a result of project construction do not represent a significant impact. The incremental loss of streambank habitat to the overall Mad River corridor is not large.
- e) Installation of the stone protection and concrete double walls associated with the proposed channel widening will interfere with wildlife access to the Mad River and along the Mad River corridor at the points where this work occurs. Wildlife usage of the Mad River, however, should be relatively unimpaired.
- f) Impacts to the fishery resources of the Mad River will be minimal. While the habitat value of the 300 and 600 foot long widened channel sections will be marginal, the installation of low flow channels in these sections will maintain free fish passage up and downstream of the project area. This measure will maintain the integrity and quality of the Mad River as aquatic habitat, and consequently, the value of the fisheries resources it contains.

In view of the foregoing, I have determined that the proposed Local Flood Control Project will not have any significant impacts which would necessitate the preparation of an Environmental Impact Statement. There are no major unresolved issues at this time.

19 OCT 87  
Date

  
\_\_\_\_\_  
Thomas A. Rhen  
Colonel, Corps of Engineers  
Division Engineer

404 (b)(1) Evaluation

NEW ENGLAND DIVISION  
U.S. ARMY CORPS OF ENGINEERS, WALTHAM, MA  
SECTION 404(b)(1) EVALUATION

PROJECT: Mad River (Woodtick), Waterbury, Connecticut

PROJECT MANAGER: Robert Russo EXT. 7547

FORM COMPLETED BY: Ernest Waterman EXT. 7231

PROJECT DESCRIPTION:

The proposed plan involves widening the existing channel along two sections of the Mad River totaling 900 linear feet which were determined to be the most restricted in the project area. These two sections are located in the vicinity of Frost Road Bridge and opposite Bouffard Avenue. Flood flow in these areas are restricted as a result of encroachment by adjacent property owners and the accumulation of silt and debris. The proposed channel would have a 50 foot bottom width and two horizontal on one vertical side slopes. Riprap and concrete double walls would be used to protect bridge abutments, utility crossings, storm drain outlets, and exposed areas of the riverbank from erosion.

In the vicinity of the Frost Road Bridge, channel widening would extend from station 235+00 below the bridge to station 241+00 above for a total of 600 linear feet. Retaining walls would be emplaced on the right and left bank from station 236+85 to station 238+40. On the left bank the doublewall would be flanked on the upstream and downstream ends by stone protection to be emplaced from station 235+00 to 239+30.

In the vicinity of Bouffard Avenue, channel widening would extend from station 264+00 to station 267+00 for a total of 300 linear feet. Stone protection would be emplaced on the left bank from station 264+00 to station 266+66 and as much as 200 linear feet of doublewall may be placed at station 265+50 to protect a private residence if needed.

NEW ENGLAND DIVISION  
U.S. ARMY CORPS OF ENGINEERS, WALTHAM, MA

PROJECT: Mad River (Woodtick), Waterbury, Connecticut.

SHORT-FORM  
Evaluation of Section 404(b)(1) Guidelines

1. Review of Compliance (Section 230.10(a)-(d)).      Preliminary      Final

- a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative);
- YES    NO\*    YES    NO\*\*
- b. The activity does not appear to:
- 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and 3) violate requirements of any Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);
- YES    NO    YES    NO
- c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values (if no, see section 2);
- YES    NO    YES    NO
- d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5).
- YES    NO    YES    NO

\* page 6; footnote 1  
\*\* page 6; footnote 2

YES    NO    YES    NO  
Proceed    Proceed  
to Sec.2    to Sec.6

## 2. Technical Evaluation Factors (Subparts C-F).

N/A      Not  
Signif-    Signif-  
icant      icant\*

### a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).

- 1) Substrate.
- 2) Suspended particulates/turbidity.
- 3) Water.
- 4) Current patterns and water circulation.
- 5) Normal water fluctuations.
- 6) Salinity gradients.

		X	
		X	
		X	
		X	
X			
X			

### b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D).

- 1) Threatened and endangered species.
- 2) Fish, crustaceans, mollusks and other aquatic organisms in the food web.
- 3) Other wildlife.

X			
		X	
		X	

### c. Potential Impacts on Special Aquatic Sites (Subpart E).

- 1) Sanctuaries and refuges.
- 2) Wetlands.
- 3) Mud flats.
- 4) Vegetated shallows.
- 5) Coral reefs.
- 6) Riffle and pool complexes.

X			
		X	
X			
		X	
X			
		X	

### d. Potential Effects on Human Use Characteristics (Subpart F).

- 1) Municipal and private water supplies.
- 2) Recreational and Commercial fisheries.
- 3) Water-related recreation.
- 4) Aesthetics.
- 5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves.

X			
		X	
		X	
		X	
X			

Remarks: Explanation of identified significant impacts:

3. Evaluation and Testing (Subpart G).

- a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

- |   |            |
|---|------------|
| 1) Physical characteristics.....  | <u>IXI</u> |
| 2) Hydrography in relation to<br>known or anticipated<br>sources of contaminants.....   | <u>II</u>  |
| 3) Results from previous<br>testing of the material or<br>similar material in the<br>vicinity of the project.....   | <u>II</u>  |
| 4) Known, significant sources<br>of persistent pesticides<br>from land runoff or<br>percolation.....  | <u>II</u>  |
| 5) Spill records for petroleum<br>products or designated hazardous<br>substances (Section 311 of CWA).....  | <u>II</u>  |
| 6) Public records of significant<br>introduction of contaminants from<br>industries, municipalities, or other sources.....  | <u>II</u>  |
| 7) Known existence of substantial<br>material deposits of substances<br>which could be released in harmful<br>quantities to the aquatic environment<br>by man-induced discharge activities..... | <u>II</u>  |
| 8) Other sources (specify).....   | <u>II</u>  |

List appropriate references.

Fill placement will consist of placement of class I  
stone protection, construction of concrete  
doublewalls and backfill of existing bank material.

- b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.

IXI  
YES

II  
NO\*

Proceed to Section 4

\* page 6; footnote 4



4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

- 1) Depth of water at disposal site.....IXI
- 2) Current velocity, direction, and  
variability at disposal site.....IXI
- 3) Degree of turbulence.....II
- 4) Water column stratification.....II
- 5) Discharge vessel speed and  
direction.....II
- 6) Rate of discharge.....II
- 7) Dredged material characteristics  
(constituents, amount, and type  
of material, settling velocities).....II
- 8) Number of discharges per unit of  
time.....II
- 9) Other factors affecting rates and  
patterns of mixing (specify).....II

List appropriate references.

- b. An evaluation of the appropriate factors in  
4a above indicates that the disposal site  
and/or size of mixing zone are acceptable.....IXI II  
YES NO

5. Actions To Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken,  
through application of recommendation of Section  
230.70-230.77 to ensure minimal adverse effects of  
the proposed discharge.....IXI II  
YES NO\*

List actions taken.

Construction operations will be conducted during the  
period of seasonal low flow on the Mad River which will  
minimize turbidity and sedimentation in the river. The  
period of seasonal low flow has been identified as July  
1 to November 30, but additional hydrological  
information will be collected to confirm this finding.

Return to Section 1 for final compliance review.

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

- a. Physical substrate  
(review sections 2a, 3, 4, and 5 above). YES   X   NO
- b. Water circulation, fluctuation and salinity  
(review sections 2a, 3, 4, and 5). YES   X   NO
- c. Suspended particulates/turbidity  
(review sections 2a, 3, 4, and 5). YES   X   NO
- d. Contaminant availability  
(review sections 2a, 3, and 4). YES   X   NO
- e. Aquatic ecosystem structure, function  
and organisms (review sections 2b and  
c, 3, and 5) YES   X   NO
- f. Proposed disposal site  
(review sections 2, 4, and 5). YES   X   NO
- g. Cumulative effects on the aquatic  
ecosystem. YES   X   NO
- h. Secondary effects on the aquatic  
ecosystem. YES   X   NO

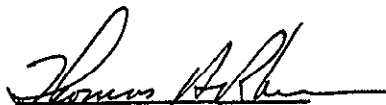
7. Findings of Compliance or non-compliance.

- a. The proposed disposal site for discharge of dredged  
or fill material complies with the Section 404(b)(1)  
guidelines.....  X
- b. The proposed disposal site for discharge of dredged  
or fill material complies with the Section 404(b)(1)  
guidelines with the inclusion of the following  
conditions.....
- c. The proposed disposal site for discharge of dredged or  
fill material does not comply with the Section 404(b)(1)  
guidelines where:
  - 1) There is a less damaging practicable .....    
alternative

- 2) The proposed discharge will result in significant degradation of the aquatic ecosystem.....1 1
- 3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem.....1 1
- 4) There is insufficient information available to determine compliance of the proposed discharge.....1 1

19 OCT 87

DATE



THOMAS A. RHEN  
Colonel, Corps of Engineers  
Division Engineer

#### FOOTNOTES

- 1) Negative responses to three or more of the compliance criteria at this stage indicate that the proposed project may not be evaluated using this "short form procedure". Care should be used in assessing pertinent portions of the technical information of items 2 a-e, before completing the final review of compliance.
- 2) Negative response to one of the compliance criteria at this stage indicates that the proposed project does not comply with the guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short form evaluation process is inappropriate".
- 3) A significant response indicates that the proposed project may not be in compliance with the Section 404(b)(1) Guidelines.
- 4) If the dredged or fill material cannot be excluded from individual testing, the "short form" evaluation process is inappropriate.
- 5) A negative response indicates that the proposed project does not comply with the guidelines.

Local Flood Protection  
Mad River  
Waterbury ( Woodtick Area ), Connecticut

APPENDICES  
FOR  
DEFINITE PROJECT REPORT

**LOCAL FLOOD PROTECTION  
MAD RIVER  
WATERBURY (Woodtick Area), Connecticut**

**TABLE OF CONTENTS**

**SECTION**

- |          |                                     |
|----------|-------------------------------------|
| <b>1</b> | <b>Hydrologic Analysis</b>          |
| <b>2</b> | <b>Economic and Social Analysis</b> |
| <b>3</b> | <b>Geotechnical Studies</b>         |
| <b>4</b> | <b>Real Estate</b>                  |
| <b>5</b> | <b>Public Involvement</b>           |

**SECTION 1**  
**HYDROLOGIC ANALYSIS**

MAD RIVER FLOOD CONTROL  
WOODTICK AREA  
WATERBURY, CONNECTICUT

HYDROLOGIC ANALYSIS  
FOR  
FLOOD CONTROL

BY  
HYDROLOGIC ENGINEERING SECTION  
WATER CONTROL BRANCH  
ENGINEERING DIVISION

NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASSACHUSETTS

December 1985

MAD RIVER FLOOD CONTROL  
WOODTICK AREA  
WATERBURY, CONNECTICUT

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
1	PURPOSE	1-1
2	DESCRIPTION	1-1
3	CLIMATOLOGY	1-1
4	STREAMFLOW	1-2
5	FLOOD HISTORY	1-2
	a. General	1-2
	b. September 1938	1-6
	c. December 1948-January 1949	1-6
	d. August 1955	1-6
	e. October 1955	1-6
	f. January 1979	1-6
	g. June 1982	1-7
6	NAUGATUCK FLOOD CONTROL	1-7
7	FLOOD FREQUENCIES	1-7
8	ANALYSIS OF FLOODS	1-8
	a. General	1-8
	b. Flood Profiles	1-8
	c. Stage Discharge Relations	1-8
	d. Stage Frequency Relations	1-9
9	STANDARD PROJECT FLOOD	1-9
	a. General	1-9
	b. Rainfall	1-9
	c. Unit Hydrograph	1-9
	d. Standard Project Flood	1-9



TABLE OF CONTENTS Cont.

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
10	FLOOD CONTROL IMPROVEMENTS	1-10
	a. General	1-10
	b. Recommended Plan of Improvement	1-11
	c. Effects of Improvements	1-11
	d. Project Design Flood	1-11
	e. Residual Flooding	1-12
	f. Velocities	1-12
	g. Riprap Design	1-12
	h. Downstream Effects	1-12

### LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
1-1	Leadmine Brook Average Monthly Runoff in Inches	1-3
1-2	Mad River and Leadmine Brook Flood Discharge Data	1-4
1-3	Naugatuck River Basin Historic Flood Data	1-5
1-4	Unit Hydrograph Characteristics	1-10

### LIST OF PLATES

<u>Plate</u>	<u>Title</u>
1-1	Naugatuck River Watershed Map
1-2	Mad River Watershed Map
1-3	Discharge Frequency Curves
1-4	Stage Discharge and Stage Frequency Curves
1-5	Plan and Profile Number 1
1-6	Plan and Profile Number 2
1-7	Plan and Profile Number 3
1-8	Plan and Profile Number 4

MAD RIVER FLOOD CONTROL  
WOODTICK AREA  
WATERBURY, CONNECTICUT

HYDROLOGIC ANALYSIS

1. PURPOSE

This report presents hydrologic information and analysis pertinent to the planning and design of flood control improvements along the Mad River in the Woodtick area of Waterbury, Connecticut. Included are sections on watershed description, climatology, flood frequencies, analysis of floods and channel improvements for flood control.

2. DESCRIPTION

The Mad River originates at Cedar Swamp Pond in Wolcott, Connecticut and flows in an erratic southwesterly course for about 11 miles to its confluence with the Naugatuck River in Waterbury. The Naugatuck flows south to its confluence with the Housatonic River at Derby Connecticut. The Mad River, at Waterbury, has a total drainage area of 26.4 square miles and a total fall of about 640 feet. The basin is quite steep and the lower basin is heavily urbanized.

The Woodtick reach of the Mad River, the subject of this study report, extends from Homestead dam, at river mile 3.7 (19,500 feet), up to Sharon Road at river mile 5.4 (28,400 feet), for a total reach length of about 1.7 miles (9,000+ feet). The drainage area of the Mad River at Homestead Dam is 17.4 square miles.

A Naugatuck River basin map is shown on plate 1-1 and a map of the Mad River watershed is shown on plate 1-2.

3. CLIMATOLOGY

The Mad River basin has a variable climate and frequently experiences periods of heavy precipitation produced by local thunderstorms and larger weather systems of tropical or extra-tropical origin. The basin lies in the path of the prevailing "westerlies" which produce frequent weather changes. The average annual precipitation in the basin is about 48 inches distributed rather uniformly throughout the year. Monthly extremes range from a high of more

than 16 inches in August 1955 to less than 0.2 inches on several occasions. Some flood related storm rainfalls are listed in table 1-3 and discussed in paragraph 5, "Flood History". The average annual temperature in the basin is about 50° Fahrenheit, ranging from an average July temperature of 73 degrees to a January average of 28°F. Temperature extremes range from occasional highs of over 100°F to infrequent lows below 0°F. Precipitation often occurs as snow during the period December through March with average annual snowfall in the Naugatuck basin varying from about 40 inches in the lower basin to about 70 inches at the higher elevations. Based on snow courses by the Corps of Engineers, in the general region, water content of the snow cover usually reaches a maximum in late February averaging about 2.0 inches but some years as high as 6.0 inches. Floods on the Mad River can result from snowmelt in combination with intense rainfall but seldom from snowmelt alone.

#### 4. STREAMFLOW

There are no long term streamflow records for the Mad River in Waterbury, Connecticut. A temporary peak stage gage was installed in 1984 by the U.S. Geological Survey, at the request of the Corps of Engineers, at a site on the river near its mouth in Waterbury. There have been no significant high flows since its installation and the gage is not as yet fully calibrated. There are long term flow records on the main stem of the Naugatuck River both downstream of Waterbury at Naugatuck (D.A. = 246 square miles), and upstream at Thomaston (D.A. = 97.2 square miles). Peak discharges on the Naugatuck have been modified since 1960 by a system of flood control reservoirs. These reservoirs, constructed by the Corps of Engineers following the disastrous floods of 1955, are located on plate 1-1 and discussed further in paragraph 6, "Naugatuck Flood Control".

Leadmine Brook is a gaged unregulated stream in the Naugatuck basin, comparable in size to the Mad River at Woodtick, and located about 15 miles north of the Mad River. Average monthly streamflows of Leadmine Brook (D.A. = 19.6 square miles) are listed in table 1-1. Average annual runoff in the basin is about 26 inches or about 54 percent of average annual precipitation. Peak streamflows in the basin are discussed in paragraph 5, "Flood History".

#### 5. FLOOD HISTORY

a. General. Historically the Naugatuck River basin has been prone to intense storm rainfalls with resulting floods. The flood of August 1955 was the most disastrous historic event in the Naugatuck basin. Some storm rainfalls and recorded discharges for the larger floods are listed in tables 1-2 and 1-3. Also listed are estimated peak discharges for the Mad River at Woodtick. Mad River

TABLE 1-1

MONTHLY RUNOFF  
LEADMINE BROOK AT HARWINTON, CONNECTICUT  
D. A. = 19.6 SQUARE MILES  
 (continuous recording period 1960 thru 1973)

<u>Month</u>	<u>Mean</u>		<u>Maximum</u>		<u>Minimum</u>	
	<u>cfs</u>	<u>Inches</u>	<u>cfs</u>	<u>Inches</u>	<u>cfs</u>	<u>Inches</u>
January	39	2.3	80	4.7	12	0.7
February	49	2.6	102	5.4	18	1.0
March	86	5.1	133	7.8	48	2.8
April	69	3.9	105	6.0	27	1.5
May	41	2.4	64	3.8	14	0.8
June	29	1.7	87	5.0	5	0.3
July	16	0.9	43	2.5	1	0.1
August	12	0.7	56	3.3	1	0.1
September	10	0.6	35	2.0	1	0.1
October	16	0.9	33	1.9	2	0.1
November	37	2.1	86	4.9	4	0.2
December	43	2.5	101	5.9	17	1.0
Annual	37	25.6	64	44.3	17	11.8

TABLE 1-2

MAD RIVER AND LEADMINE BROOK  
FLOOD DISCHARGE DATA

<u>Floods</u>	<u>Estimated Mad River at Mouth (D.A. = 26.4)</u>	<u>Estimated Mad River at Woodtick (D.A. = 17.4)</u>	<u>Computed at Leadmine Brk USGS Gage (D.A. = 19.6)</u>
Sep 1938	3,500 cfs	2,300	4,300
Dec 1948	4,000	2,600	3,700
Aug 1955	6,000	4,000	7,400
Oct 1955	4,500	3,100	2,200
Jan 1979	4,000	2,600	580
Jun 1982	5,000	3,500	1,980
10% (10 yr)	2,700	1,800	2,800
2% (50 yr)	4,800	3,100	5,400
1% (100 yr )	6,000	4,000	7,000

TABLE 1-3

NAUGATUCK RIVER BASIN  
HISTORIC FLOOD DATA

	<u>Sep 1938</u>	<u>Dec 1948</u>	<u>Aug 1955</u>	<u>Oct 1955</u>	<u>Jan 1979</u>	<u>Jun 1982</u>
<u>MAD RIVER</u>						
Storm Rainfall (inches)	9	7.2	10	9.7	4	10
Max 1 Day Rain (inches)	4.2	5.2	8.3	4.7	3.6	6
Naugatuck Storm Center	Upper	Upper	Upper	Uniform	Uniform	East-Central
Est. Peak Q (cfs)						
at Mouth (D.A. = 26.4)	3,500	4,000	6,000	4,500	4,000	5,000
(CSM)	130	150	230	180	150	190
at Woodtick (D.A. = 17.4)	2,300	2,600	4,000	3,100	2,600	3,500
(CSM)	130	150	230	180	150	200
<u>NAUGATUCK RIVER AT THOMASTON</u>						
Drainage Area	71.9	97.2***	97.2***	97.2***		
(Net Drainage Area)*					(76)	(76)
Peak Q (cfs)	10,000	14,100	51,400	10,000	10,000**	7,600**
(CSM)	139	145	530	100	130	100
<u>NAUGATUCK RIVER AT</u> <u>NAUGATUCK BEACON FALLS</u>						
Drainage Area - Naugatuck	246	246	246	246		
(Net Drainage Area) - B. Falls					(109)	(109)
Peak Q (cfs)	25,300	28,500	106,000	30,400	18,700	15,600
(CSM)	102	115	430	123	170	140

\*Net Drainage Area after Corps Reservoirs

\*\*Computed inflow to Thomaston Reservoir

\*\*\*Gage relocated further downstream

discharge estimates were based on an analysis of: (1) recorded peak discharges in the region, (2) net local inflows to Naugatuck River, i.e.; Thomaston flow - Naugatuck flow, (3) relative storm rainfalls and (4) miscellaneous high water information and computed discharge ratings. Following are discussions of some of the flood producing storm events experienced in the Naugatuck River basin over the past 50-years.

b. September 1938. This flood was the result of intense rainfall accompanying a tropical hurricane. The storm which started with light rain, gradually increased in intensity over the four day period 17 - 21 September. Total storm rainfall at Waterbury was about 9 inches with a maximum one day rainfall of about 4.2 inches. Peak flow on the Mad River at Woodtick was estimated to have been in the order of 2,300 cfs.

c. December 1948 - January 1949. The "New Year's" storm of 1949 was a coastal low pressure system that became blocked over New England producing intense rainfall over western Connecticut and Massachusetts. Total precipitation from 29 December to 2 January was about 7.2 inches in the Mad River area with a maximum 1 day rainfall of about 5.2 inches. Snowmelt had little effect on peak flows but frozen ground conditions enhanced rates of rainfall runoff. Peak flow on the Mad River at Woodtick was believed to have been in the order of 2,600 cfs.

d. August 1955. The hurricane "Diane" storm of August 1955 produced record breaking floods throughout much of southern New England and was particularly severe in the Naugatuck basin, producing flooding far greater than any previously known event. The rains fell on ground previously saturated by rainfall from hurricane "Connie" which occurred one week earlier. Storm rainfall, from the 17th to the 20th of August, was about 10 inches in the Waterbury area with a 1 day maximum of about 8.3 inches. Peak flow on the Mad River at Woodtick was believed in the order of 4,000 cfs.

e. October 1955. The Naugatuck basin had not recovered from the August event when it experienced another great flood in October 1955. This flood was produced by a northerly moving coastal low pressure system that became stalled south of the New England coast, producing heavy rain over western Massachusetts and Connecticut. Total precipitation in the Mad River area between 14 - 17 October was about 9.7 inches with a maximum 1 day total of about 4.7 inches. Resulting peak flow on the Mad River at Woodtick was estimated to have been about 3,100 cfs.

f. January 1979. Flooding resulted on the Mad River in January 1979 when intense rainfall on the 21st totalling about 4



inches in a 24 hour period, climaxed the wettest January of record. Total rainfall for the month in the area was over 8 inches. It was estimated that the resulting peak flow on the Mad River at Woodtick was in the range of 2,600 cfs.

g. June 1982. The most recent major flood event in the area, and one that was particularly severe and localized in south central Connecticut, occurred in June 1982. This flood resulted from a "Northeaster" storm that settled over southern New England producing a 4 - 6 June storm rainfall of about 10 inches with about 7 inches occurring on the 5th. Heaviest rainfall skirted the south - east side of the Naugatuck basin. Therefore flooding was more severe in southern tributaries on the east side of the Naugatuck basin than over the basin as a whole. Though records within the area are limited, it is believed that rainfall was most intense in the very upper portions of the Mad River watershed. Peak flow on the Mad River at Woodtick has been estimated at about 3,500 cfs, making this event second only to the August 1955 flood.

#### 6. NAUGATUCK FLOOD CONTROL

Following the disastrous Naugatuck River flood of August 1955, the Corps of Engineers designed and constructed a comprehensive flood control system for the Naugatuck River. The system included both local protection projects and reservoirs. Local protection projects consisted generally of dikes, walls and channel improvements, at Torrington, Waterbury - Watertown and Ansonia - Derby, Connecticut. The seven reservoirs, namely; Thomaston, Black Rock, Hop Brook, Hancock Brook, Northfield Brook, East Branch and Hall Meadow Brook, combined, control the runoff from 152 square miles of drainage area or about 50 percent of the total 312 square miles Naugatuck River watershed. This system provides a high degree of flood control on the main stem Naugatuck and on those tributaries having reservoirs. Unfortunately in developing the comprehensive system, no reservoir sites or local protection improvements were found feasible on the Mad River tributary at Waterbury. The locations of the Naugatuck River flood control projects are shown on plate 1-1.

#### 7. FLOOD FREQUENCIES

With no long term streamflow records for the Mad River, peak discharge frequencies were estimated based on: (a) statistical analysis of long term stream flow records of a similar sized watershed in the region - Leadmine Brook, (b) analysis of historic storm rainfalls and resulting peak runoff rates and (c) regional flood contributions, including Mad River, to Naugatuck River flood flows,

i.e. Thomaston floodflow minus Naugatuck flow. Developed comparative flood data for the six known historic floods in the area are listed in tables 1-2 and 1-3. The adopted discharge frequency curve for the Mad River at Woodtick is shown on plate 1-3. Believing the historic flood events probably represented the greatest events in the past century, the historic flood events were assigned Weibull Plotting Positions using a 100-year base period and a curve was fitted to the plotted points without expected probability adjustment. An expected probability adjusted curve, assuming 20 years of record, is also shown on plate 1-3 for comparison purposes. Also shown on plate 1-3 is the comparative frequency curve for Leadmine Brook developed by Log Pearson Type III statistical analysis using 53 years of flow records. The computed mean, standard deviations and skew were 3.066, 0.2886 and +0.6, respectively.

## 8. ANALYSIS OF FLOODS

a. General. Notable hydraulic characteristics of the Mad River through the Woodtick area affecting the flood situation are: (1) a relatively flat stream gradient averaging only about 5 feet per mile (.001 ft/ft), (2) relatively low riverbanks (shallow channel), with resulting low lying flood plains, and (3) localized restrictive channel and overbank sections, particularly in the vicinity of Frost Street crossing (river station 24+000) and near the Royal Crest apartments (river station 26+600).

b. Flood Profiles. Backwater flood profiles on the Mad River in Woodtick were computed starting at the downstream Homestead Dam at river station 19+500 and proceeding upstream a distance of 9,000 feet to Sharon Road bridge. Homestead Dam has a crest length of 60 feet at elevation 445 feet NGVD. A rating curve at the dam was computed using the weir equation with a coefficient "C" of 3.0. Backwater computations were made using cross section data from a recently completed Flood Insurance Study by FEMA and 2-foot contour mapping provided by the city of Waterbury.

Computations were made using the Corps HEC-2 computer program with Manning's "n" roughness coefficients of 0.04 for channel and 0.08 for overbank areas. Expansion and contraction coefficients were generally 0.5 and 0.3., respectively. The backwater model was calibrated by comparing the computed June 1982 flood profile with recorded high watermark data at the "Royal Crest" apartments, reported levels at other locations, and photographs of the June 1982 flooding. Plans and profiles are shown on plates 1-5 through 1-8.

c. Stage Discharge Relations. Stage discharge relationships, at three selected damage index stations, were developed using the HEC-2 backwater model. The developed rating curves for river stations 23+950, 26+435 and 27+665 are shown on plate 1-4.

d. Stage Frequency Relations. Stage frequency curves were developed at the three index stations using the adopted discharge frequency curves and the developed stage discharge curves. The resulting stage frequency curves are also shown on plate 1-4.

## 9. STANDARD PROJECT FLOOD

a. General. Recommended flood control improvements for the Mad River at Woodtick will not provide for Standard Project Flood (SPF) protection, however, an estimated SPF was developed as a "standard" against which the flood potential of the river could be judged, in comparison to the estimated frequency and magnitude of experienced floods. The SPF represents the flood discharge that may be expected from the most severe combination of meteorological and hydrologic conditions that are considered reasonably characteristic of the region, excluding extremely rare combinations. The SPF for the Mad River at Woodtick was developed by applying standard project storm rainfall to an adopted unit hydrograph in accordance with EM 1110-2-1411.

b. Rainfall. Standard project 24 hour storm rainfall for the 17.4 square mile Mad River watershed at Woodtick, from EM 1110-2-1411, was 12.2 inches. Assumed infiltration losses of 2.1 inches resulted in a 24 hour rainfall excess of 10 inches. Much of the standard project storm rainfall occurs in a short period with maximum 3 hour and 6 hour rainfalls of 5.9 and 8.8 inches, respectively.

c. Unit Hydrograph. A 3 hour unit hydrograph was developed for the 17.4 square mile Mad River watershed at Woodtick using Snyder's unit graph parameters considered representative of the region and physical characteristics of the watershed. The unit graph was calibrated against its ability to reproduce the June 1982 peak discharge. Unit graph characteristics that best reproduced the June 1982 experienced peak are listed in table 1-4. The developed unit graph was peaked 25 percent for use with standard project rainfall to allow for possibly increased runoff rates under more intense rainfall.

d. Standard Project Flood. Applying the standard project storm rainfall excess to the 25 percent peaked unit hydrograph resulted in a standard project flood peak discharge of 10,000 cfs on the Mad River at Woodtick (D.A. = 17.4 square miles). Computed profiles for the SPF, both with and without improvements, are shown on plates 1-5 thru 1-8.

TABLE 1-4

UNIT HYDROGRAPH CHARACTERISTICS

D.A. = 17.4 Square Miles

L = 6.25 Miles

$L_{ca}$  = 2.65 Miles

$C_T$  = 2.0

$T_p$  = 4.6 Hours

$Q_p$  = 1,150 cfs

$Q_p$  (peaked 25 percent) = 1,400 cfs

10. FLOOD CONTROL IMPROVEMENTS

a. General. Structural flood control improvements, considered in initial reconnaissance studies, included upstream reservoirs, systems of dikes and walls, and channel improvements. Upstream reservoirs were ruled out, as in earlier basin-wide flood studies, due to the lack of reservoir sites. Dikes and walls were considered infeasible due to high cost and extensive interior drainage provisions that would be required. Improvements considered most feasible, in concert with nonstructural measures, involved limited channel improvements. Localized channel enlarging reportedly resulted in maximization of both net benefits and benefits to cost ratio.

Two channel improvement plans were evaluated, the first, plan "A" involved the construction of an improved channel through the entire 9,000-foot long river reach from Homestead Dam to Sharon Road. The improved channel would be a 50-foot bottom width trapezoidal channel with 1V:2H side slopes. Such a channel, on an average 0.0005 foot per foot slope, with an assumed Manning's "n" of 0.03, would provide about 4,000 cfs capacity (1 percent chance flood) at a depth of about 10 feet. Such a channel would lower, existing condition, 1 percent flood levels by about 3 feet.

A second much less comprehensive channel improvement, plan "B", consisted of localized channel improvements, at two Woodtick

locations. The two improved reaches would total about 1,300 linear feet, or about 15 percent of total reach length. This less comprehensive plan "B" was reported to have both the greatest benefit to cost ratio and net benefits; therefore, it is the recommended plan.

b. Recommended Plan of Improvements. The recommended improvements (Plan "B") consists of:

(1) Eight hundred feet of 50 feet wide improved channel extending 500 feet downstream and 300 feet upstream of Frost Road (river station 23+900).

(2) Four hundred fifty feet of 50 feet wide improved channel extending from station 26+200 to station 26+650.

The areas of improvement are shown on plates 1-5 and 1-7. The improved channel will be a 50-foot bottom width trapezoidal section with 2H:1V side slopes, except for a 180-foot reach downstream of Frost Road where the channel will have a 50-foot wide rectangular section.

c. Effects of Improvements. The effects of the improvements will be to reduce a recurring June 1982 (2 percent chance) or the 100-year (1 percent chance) flood levels in the Woodtick reach by about 1-1/2 feet. Reductions by the improvements were analyzed using the HEC-2 backwater program, with and without improved conditions. Manning's "n" value of 0.04 for the channel was used throughout the study reach for the preproject conditions. For postproject conditions the "n" value remained 0.04 except in the localized area of improvements where it was reduced to 0.03. An overbank "n" of 0.08 was used for both pre and post project conditions. Expansion and contraction coefficients were 0.5 and 0.3, respectively. Comparative natural and modified stage-discharge and stage frequency curves are shown on plate 1-4. Natural and modified profiles for selected floods are shown on plates 1-5 through 1-8. The localized improvements will produce flood stage reductions in upstream unimproved reaches.

d. Project Design Flood. Unlike local protective works involving dikes and walls that are subject to overtopping and possible failure under greater than project design flood conditions, channel improvement projects provide for some flood stage reduction, if not complete protection, for all magnitude of floods. The recommended plan of improvements for the Mad River will provide only about 1.5 foot stage reduction at the 100-year (1 percent chance) flood level. Improvements were sized in an effort to alleviate or minimize flooding, in a repeat of the June 1982 flood discharge, at the upstream right bank site of the Royal Crest apartments, approximately river station 27+000. The recommended improvements would not eliminate all flooding at the 1 percent flood level,

but would greatly reduce damages with most residual flooding limited to shallow (generally less than 1/2 foot) street and parking lot flooding. The project design flood is therefore, categorized, as being in the range of the 50 to 100-year, (2 to 1 percent chance) magnitude of flood.

e. Residual Flooding. Residual 1 percent chance flood plain limits and residual 1 percent chance and standard project flood profiles are shown on plates 1-5 through 1-8. Lowering the 1 percent chance flood level 1.5 feet, though it reduces monetary damages considerably, does not have major effects on flood plain limits as illustrated on the referenced plates. The modified flood plain limits are not shown in areas where it is not significantly different from existing flood plain limits. Strict flood plain zoning and floodway (channel encroachment) control must be made an integral part of the recommended structural plan of improvements for reducing flood damages in the Woodtick area.

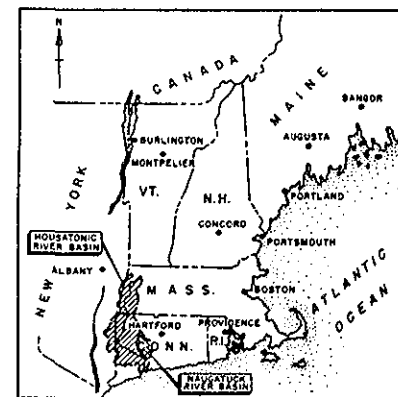
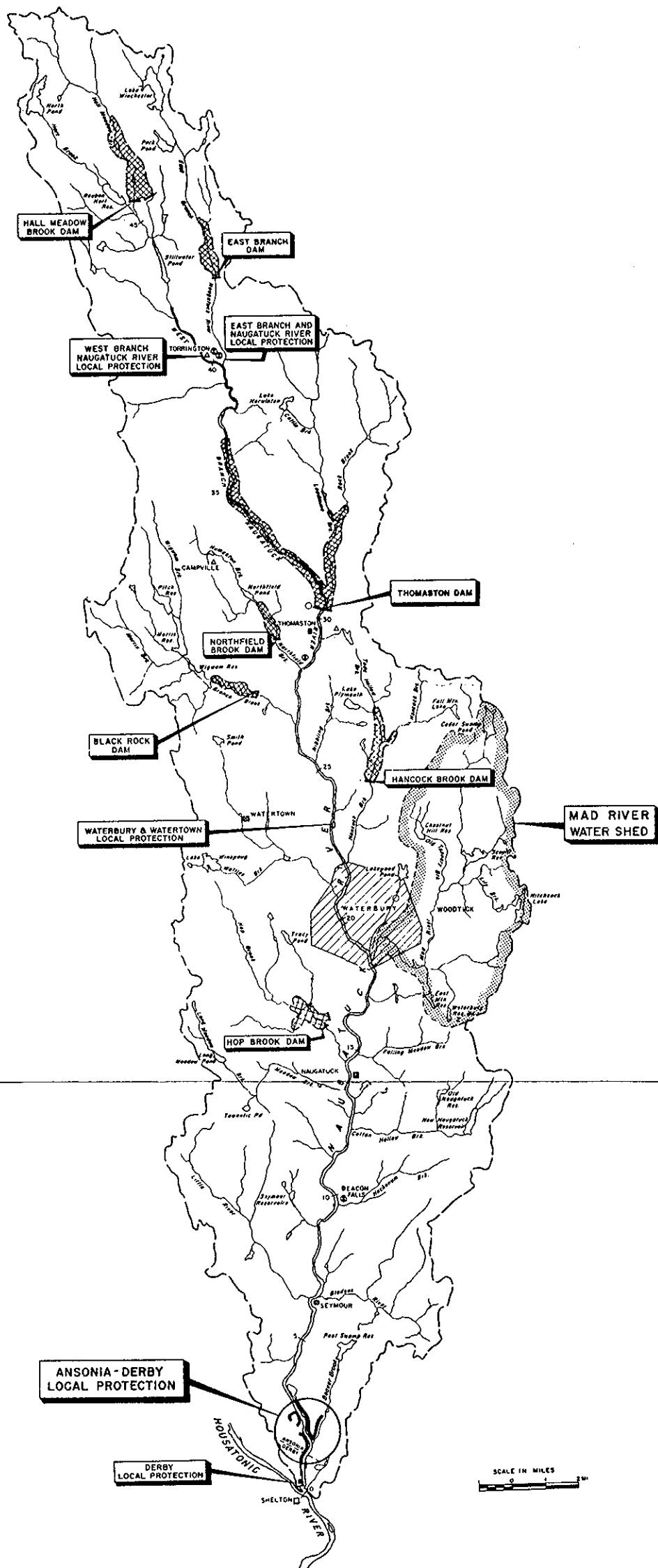
f. Velocities. Flow velocities in the improved channel sections, under a 1 percent chance flood discharge of 4,000 cfs, will generally range from 4 to 6 feet per second with maximum velocities of about 9 feet per second in the 50 foot wide rectangular sections. Project design flow depth would be about 9 feet.

g. Riprap Design. All disturbed earth channel side slopes will be riprap protected. Hydraulic analysis for riprap design was provided by the Hydraulics and Water Quality Section, Water Control Branch using tractive force theories in accordance with EM 1110-2-1601 and ETL 1110-2-120. Riprap was sized for the areas near station 23+900 and station 26+300 for the 1 percent chance flow (4,000 cfs) with an associated flow depth of 9.5 feet and 10.0 feet, respectively and for an energy gradient of 0.005 foot/foot and .0015 foot/foot respectively. Minimum  $D_{50}$  stone size for the disturbed areas assuming a 1V:2H sideslope will be 1.3 feet and 0.8 feet, respectively.

h. Downstream Effects. The reduction in flood stage afforded by the channel improvements does not have major effects on flood plain limits as shown on plates 1-5 thru 1-8. Therefore, the effect on flood plain storage is also minimal. As a result, the channel improvements recommended are considered to have no measurable effect on peak flood flows downstream of the improvements.



Δ NORFOLK



LOCATION MAP  
SCALE IN MILES  
0 40 80

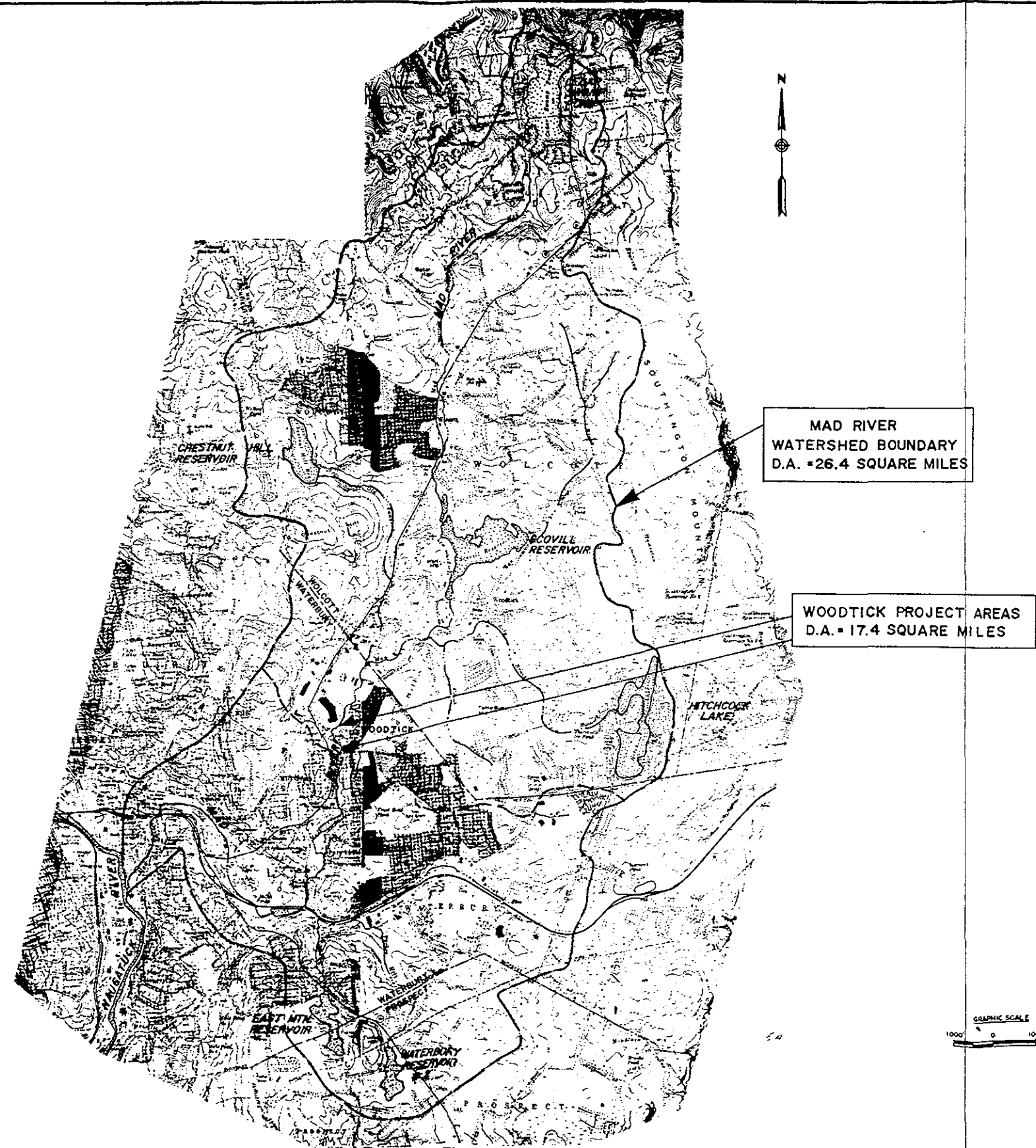
LEGEND

COMPLETED FLOOD CONTROL PROJECT

- U. S. GEOLOGICAL SURVEY GAGING STATION
- CITIES
- FLOOD CONTROL DAM SITES

SCALE IN MILES  
0 1 2

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND CORPS OF ENGINEERS	
HOUSATONIC RIVER FLOOD CONTROL	
NAUGATUCK RIVER WATERSHED MAP	
NAUGATUCK RIVER CONNECTICUT	
DATE	
SCALE 1"=1 MI. (SEE ENCL. FOR MORE DETAILS)	
SHEET	



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WALTHAM, MASS.

HOUSATONIC RIVER BASIN  
MAD RIVER, CONN.

WATERSHED MAP

HYDRO. ENG. SECT.



PEAK DISCHARGE IN 1,000 C.F.S.

20  
15  
10  
9  
8  
7  
6  
5  
4  
3  
2

0.2 0.5 1 2 5 10 20 50  
PERCENT CHANCE ANNUALLY

# DISCHARGE FREQUENCY CURVES

MAD RIVER & LEADMINE BROOK

NAUGATUCK RIVER BASIN CONNECTICUT

DEC. 1985

COMPUTED CURVE FOR  
LEADMINE BRK AT HARWINGTON CT.

D.A. = 19.6 SQ. MI. M = 3.066, STD. = 0.288, SK = +0.6, N = 53 YRS.

ADOPTED CURVE FOR  
MAD RIVER AT MOUTH

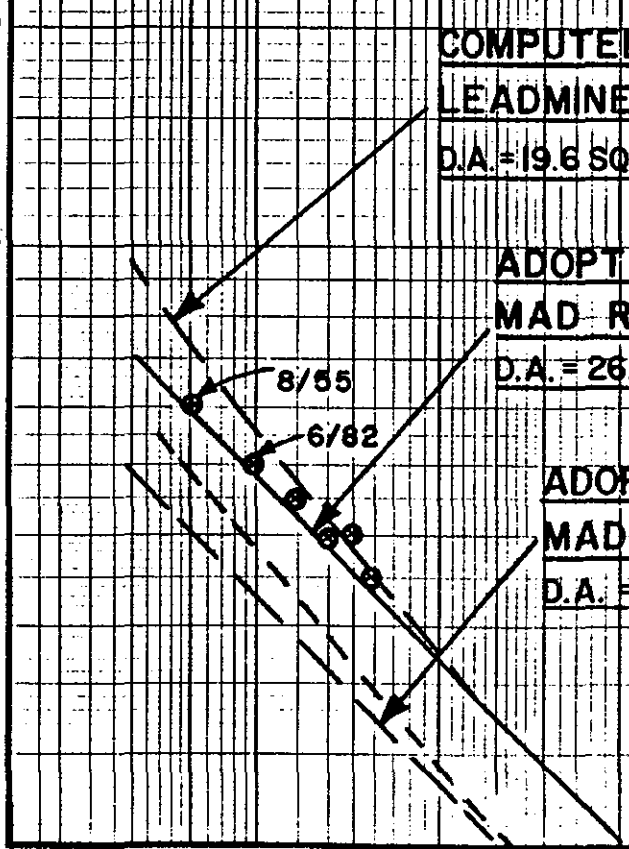
D.A. = 26.4 SQ. MI.

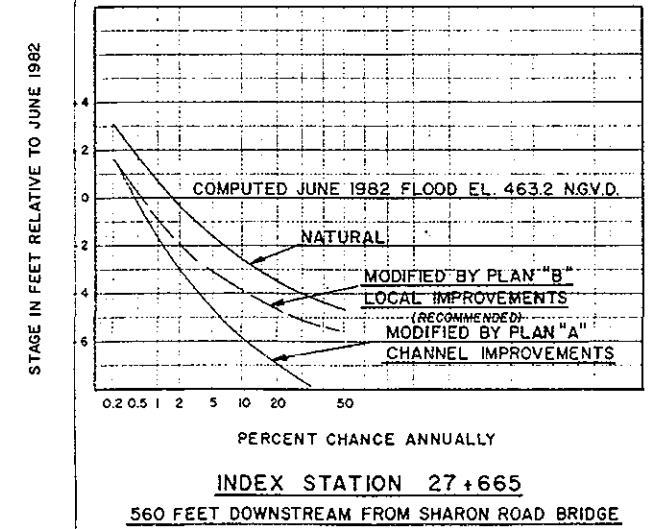
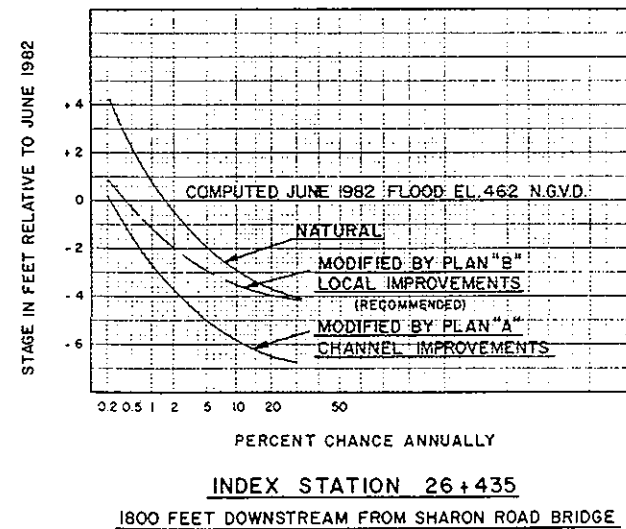
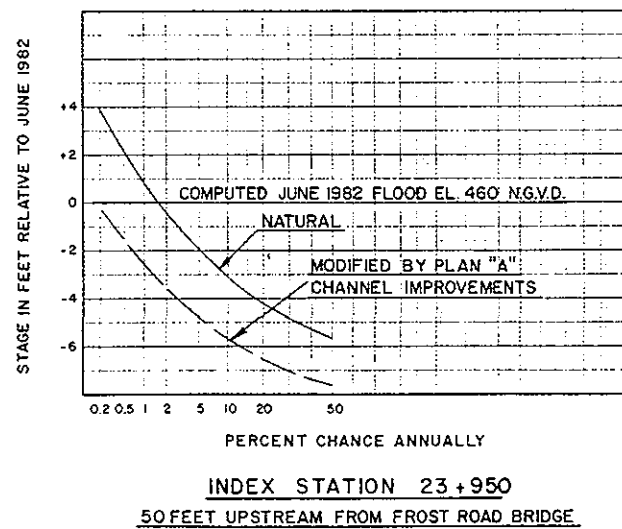
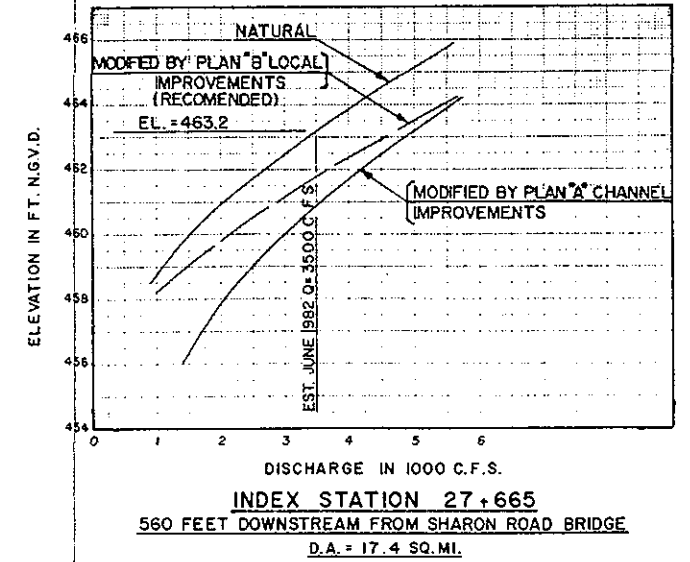
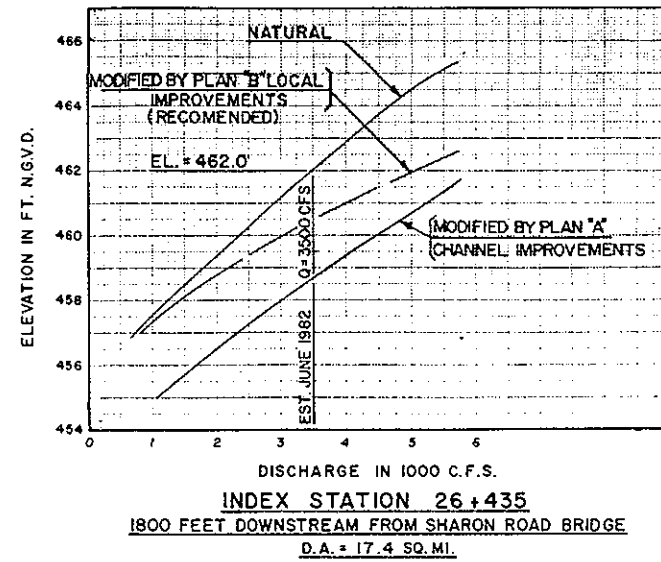
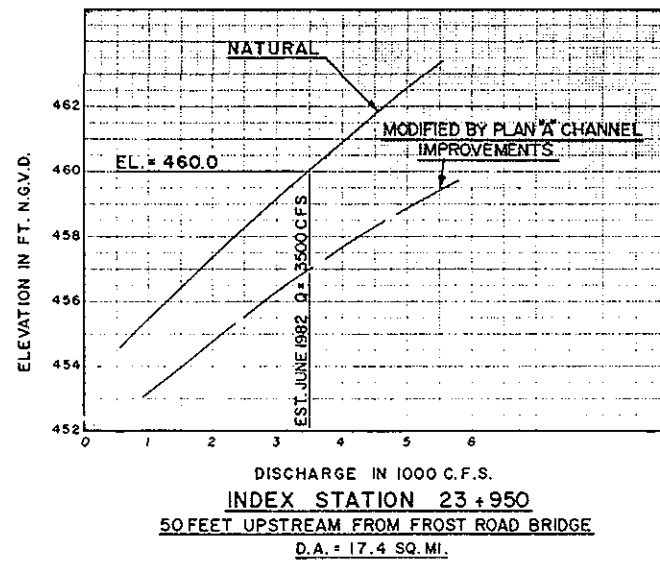
ADOPTED CURVE FOR  
MAD RIVER AT WOODTICK

D.A. = 17.4 SQ. MI.

⊗ MAD RIVER HISTORIC FLOOD DATA (ESTIMATED)

--- EXPECTED PROBABILITY ADJUSTMENT





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WALTHAM, MASS.

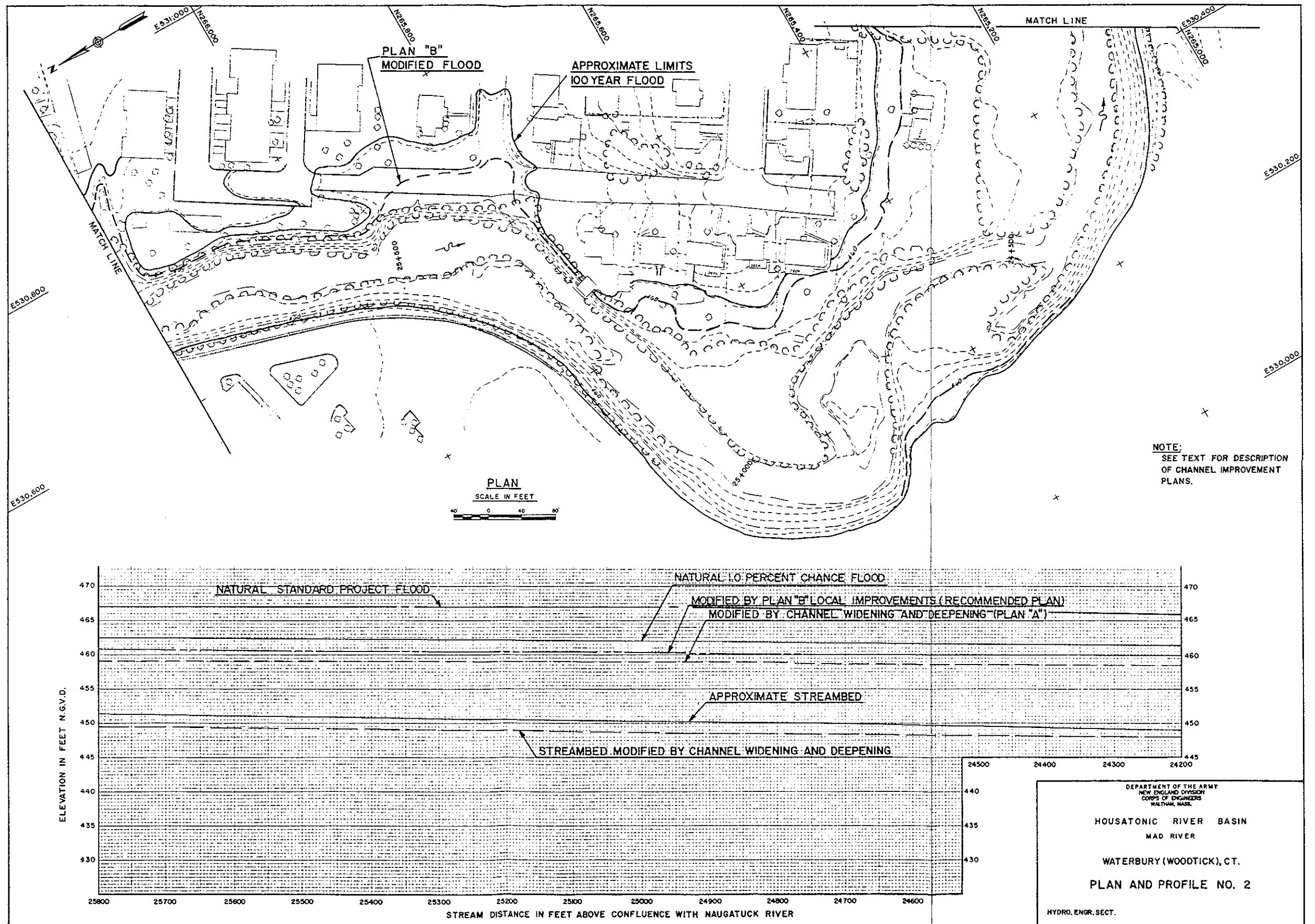
HOUSATONIC RIVER BASIN  
MAD RIVER

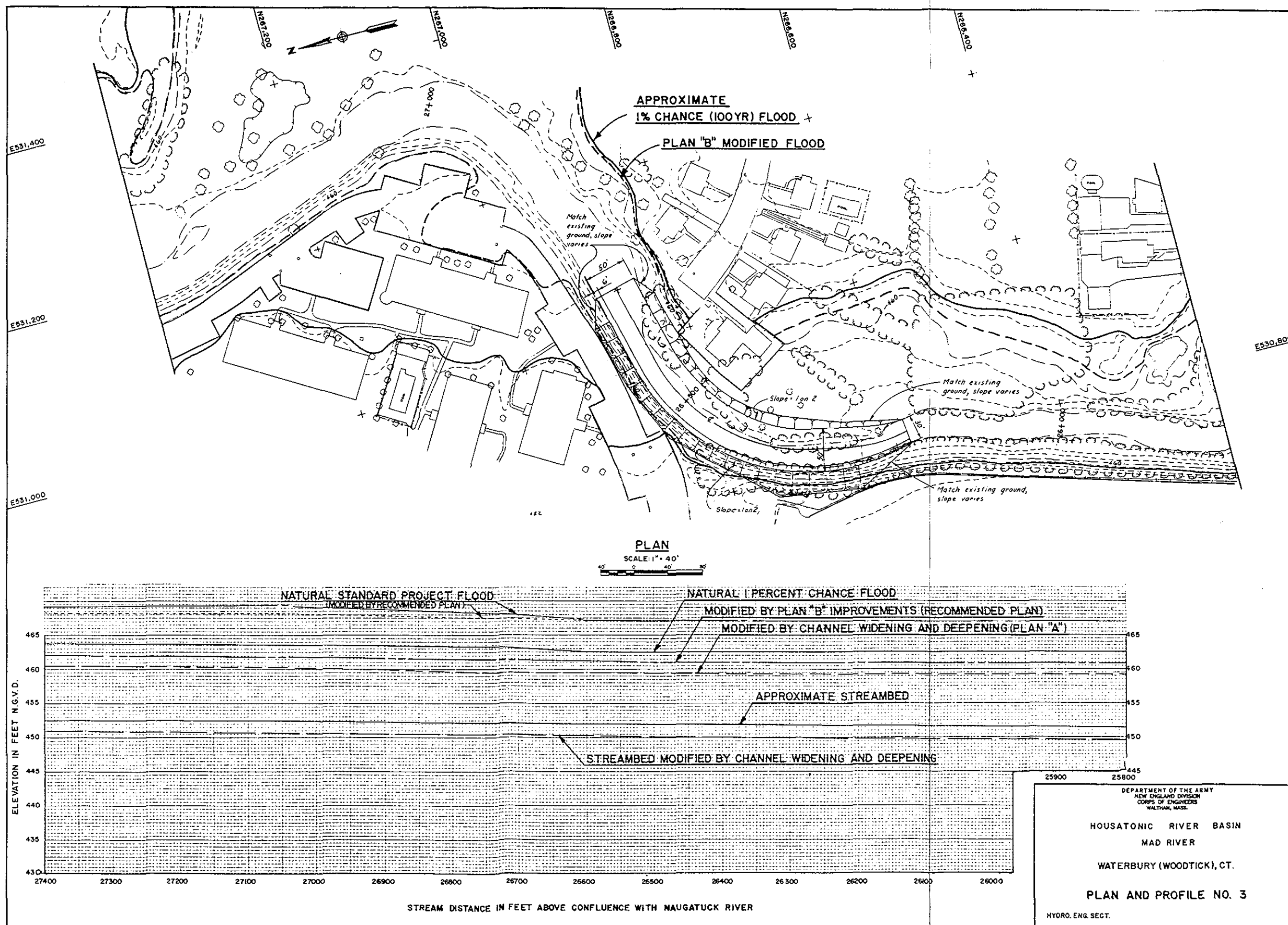
WOODTICK AREA  
WATERBURY, CONNECTICUT

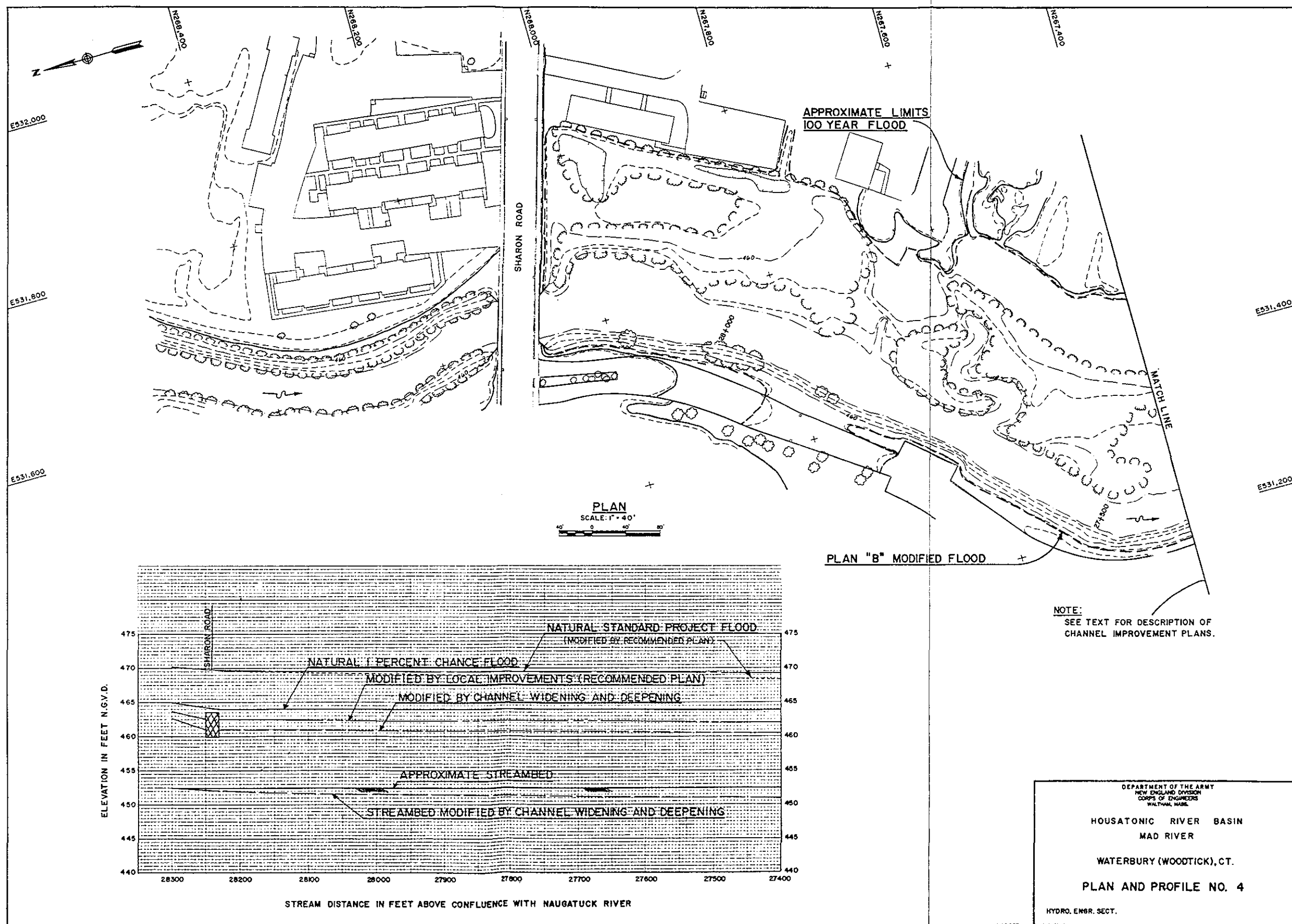
STAGE DISCHARGE CURVES  
AND  
STAGE FREQUENCY CURVES

HYDRO ENG. SECT.









## **SECTION 2**

### **ECONOMIC & SOCIAL ANALYSIS**

**Mad River, Waterbury, Connecticut  
(Woodtick Area)**

**Appendix 2**

**Economic and Social Analysis**

**December 1985**

**Marianne N. Matheny  
Regional Economist**

**New England Division  
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## Table of Contents

Purpose of Study	<u>Page</u> 2-1
<u>Base &amp; Future Conditions</u>	2-2
Economy	2-3
Population & Social Conditions	2-7
Land Use	2-11
<u>Economic Analysis</u>	2-13
Methodology	2-13
Without Plan Conditions	2-14
- Calculation of Flood Damages	
- Estimation of other flood related costs	
With Plan Condition	2-20
Alternative Flood Improvement Plans	
- Annual Benefits	
- Annual Costs	
Economic Evaluation and Conclusions	2-24

## Tables

Table 1:	Mad River, Waterbury, Connecticut (Woodtick) Summary of Flood Damages to Structures	2-2
Table 2:	Industry of Employed Persons Waterbury, Connecticut	2-4
Table 3:	20 Largest Employees in Waterbury	2-6
Table 4:	Hours and Earnings in Manufacturing Industries	2-7
Table 5:	Population Figures and Projections for Central Naugatuck Valley Region	2-9
Table 6:	Population Characteristics Waterbury and CNVR	2-10
Table 7:	Land Use in Waterbury and Wolcott, CT: Acreage and Percentage of Zoned Land	2-13
Table 8:	Recurring Damages Woodtick Area: Relationship of Probable Flood Events to Expected Flood Losses	2-18
Table 9:	Sample Calculations for Annual Damages in Flood Zone #3	2-19
Table 10:	Annual Benefits for Alternative Flood Protection Plans (Woodtick Area)	2-22
Table 11:	Annual Costs of Alternative Flood Protection Plans (Woodtick)	2-23
Table 12:	Mad River, Waterbury CT, Woodtick Area Economic Evaluation	2-24

### Purpose of Study

This study is undertaken to determine the economic feasibility of three alternative plans for flood protection along the Woodtick section of the Mad River in Waterbury, Connecticut. The plan recommended for implementation is the one which exhibits the highest net benefits in conjunction with acceptable levels of flood protection.

### The Study Area

The Mad River is located in Waterbury, Connecticut, a city in west-central Connecticut about 20 miles north of New Haven and 25 miles southwest of Hartford. The Mad River originates at Cedar Swamp Pond (in Wolcott) and flows in an erratic southwesterly course about 11 miles. The Woodtick area is located 3 miles upstream from the mouth of the Mad River and between Sharon and Frost Road Bridges. The drainage area at this location is about 17 square miles.

Flooding conditions have continued to be aggravated by development along the above area. According to some studies, flood stages experienced in June 1982 were up to 3 feet higher than the August 1955 flood of record.

It is important to stress that the city of Waterbury be aware that further development along this reach of the Mad River would cause higher damage costs to the already existing buildings.

Population losses have encouraged Waterbury to change some of its zoning regulations to extend development to the suburban edges of the city. Multi-family dwellings (particularly condominiums) have become a popular alternative to either inner city housing or more costly suburban housing in surrounding communities. This strategy has been somewhat effective in bringing population back within city limits. At present, however, there is a growing movement to place a moratorium on condominium building mainly because of inadequate traffic access to and from the newly developed areas.

Table 1

Mad River, Waterbury, Connecticut (Woodtick)  
Summary of Flood Damages to Structures

	<u>Study Area</u>		<u>Dwelling Units</u>
	<u>Buildings</u>	<u>Dwelling</u> <u>Units</u>	<u>Dwelling Units</u> <u>Likely to receive</u> <u>damage*</u>
<u>Reach 1</u>			
<u>Residential:</u>			
Single Residences	5	5	2
<u>Commercial:</u>	0	0	0
<u>Industrial:</u>	0	0	0
<u>Reach 2</u>			
<u>Residential:</u>			
Apartments	7	56	56
Single Residences	10	10	10
<u>Commercial:</u>	0	0	0
<u>Industrial:</u>	0	0	0
<u>Reach 3</u>			
<u>Residential:</u>			
Apartments	16	307	87
Condominiums	10	114	80
Duplex	1	2	0
Single Residences	4	4	4
<u>Commercial:</u>	1	1	1
<u>Industrial:</u>	1	3	3
Total:	55	502	243

\* based on flood event similar to June 1982

Base Line Conditions

Woodtick is located in the east suburban section of Waterbury, Connecticut. Waterbury has a population of 103,266 and is the fourth most populous city in the State. The city is classified as a "labor surplus area" which means that its relatively high unemployment status qualifies the area for preference in bidding on Government contracts.

Located in the west central Naugatuck Valley, Waterbury was one of the more economically depressed regions in the State during the 1960's and 1970's. Within the last few years, however, Waterbury has made a great deal of economic progress through the use of urban rehabilitation money

and efforts by city government to attract a diversity of light manufacturing firms and land developers. Waterbury had been, up to this point, a one industry city, highly vulnerable to plant closings and business cycles.

### Economy

Waterbury's economic history parallels many other small industrial "river" cities in New England. The Naugatuck River runs through the center of the city creating a valley from which sharp and rocky hills rise on either side of the river. This rocky terrain made Waterbury an unsuitable candidate for farming and therefore encouraged the development of small industry earlier than in many New England cities.

Waterbury developed into an important industrial center by the late 1700's, producing silver and tinware, brass buttons and lamps. By the mid 1800's, the city expanded its manufacturing capacity through the widespread mill system and became one of the world's largest producers of fabricated metal, metal alloys and precision metal parts.

Manufacturing began to decline in the area by 1970. "Between 1970 and 1984, Waterbury lost approximately one third of its heavy manufacturing jobs (metals, chemicals, rubber and plastic products). In 1970, just under 50% of non-farm workers were employed by manufacturing firms. By 1984, the percentage had dropped to 34%." <sup>1/</sup> Most of these job losses were particularly severe because they are among the highest paying factory jobs and have traditionally contributed a great deal to the local economy. This is cited as one of the reasons that Waterbury's economy has been so depressed over the last decade.

Table 2 shows the percentage and number of persons employed in the various sections of Waterbury's economy in 1980. Table 3 is a list of the 20 largest employers in Waterbury and Table 4 gives a sampling of wages in the different areas of manufacturing in the region.

<sup>1/</sup> 1986 Annual Planning Information Guide - Connecticut Labor Dept.

Table 2  
Waterbury, Connecticut  
Industry of Employed Persons <sup>1/</sup>

	Total Number	Percentage
Employed Persons 16 yrs and over	45,386	100
Agriculture	172	.3%
Forestry and Fisheries	--	
Mining	8	.01%
Construction	1,331	2.9%
Manufacturing	18,410	40.5%
Non-durable goods	3,237	7.1%
Food and kindred products	453	2.5%
Textile mill and finished textile products	1,002	2.2%
Printing, publishing, and allied industries	815	1.8%
Chemicals and allied products	480	1.05%
Durable goods	15,173	33.4%
Furniture, lumber and wood products	305	.6%
Primary metal industries	2,384	5.25%
Fabricated metal industries	3,630	7.9%
Machinery, except electrical	1,768	3.89%
Electrical machinery equipment and supplies	1,768	3.89%
Transportation equipment	1,345	2.9%
Transportation, Communications & Other P.U.	2,223	4.89%
Railroads	38	.08%
Trucking service and warehousing	452	.99%
Other transportation	622	1.4%
Communications	598	1.3%
Utilities and sanitary services	513	1.1%
Wholesale trade	1,576	3.4%
Retail trade	6,364	14.%
General merchandise stores	915	2.0%
Food bakery and dairy stores	1,224	2.6%
Automotive dealers and gasoline sta.	597	1.3%
Eating and drinking places	1,422	3.1%
Finance, insurance and real estate	1,927	4.2%
Banking and credit agencies	1,059	2.3%
Insurance, real estate and other finance	868	1.9%
Services	11,226	24.7%
Business services	962	2.1%
Repair services	561	1.2%
Private households	194	.4%
Other personal services	799	1.76%

<sup>1/</sup>Source - 1980 Census

Entertainment and recreation services	223	.5%
Professional and related services	8,487	18.6%
Hospitals	2,485	5.4%
Health services, except hosp.	1,797	3.95%
Elementary and secondary schools and coll.	2,741	6.04%
Other educational services	105	0.23%
Social serv., relig & membership organizations	960	2.1%
Legal, engineering, and other prof. serv.	399	.87%
Public Administration	2,149	4.73%

Table 3\*

20 Largest Employers in Waterbury, Connecticut

<u>Employment</u>	<u>Range of</u>
1. Century Brass Products	1,000 +
2. Colonial Bankcorp, Inc.	1,000 +
3. St. Mary's Hospital	1,000 +
4. Waterbury Hospital	1,000 +
5. Bristol Babcock, Inc.	500-999
6. Mattatuck Mfg. Co.	500-999
7. Southern New England Telephone	500-999
8. Anamet	250-499
9. Anchor Fasteners, Division of Buell, Inc.	250-499
10. Besco Manufacturing	250-499
11. Condiesel Mobile Equipment	250-499
12. Connecticut Light & Power Co.	250-499
13. Duracell International Battery Technology Co.	250-499
14. Haydon Switch and Instrument Ins.	250-499
15. Hemingway & Bartlett Mfg. Co.	250-499
16. Sears Roebuck	250-499
17. Sherwood Medical Industries	250-499
18. Sperry Gyroscope Corp.	250-499
19. Waterbury Buckle Co.	250-499
20. Waterbury Industrial Commons	250-499

\*Source: Waterbury Chamber of Commerce



Table 4

Connecticut Labor Department  
Hours and Earnings in Manufacturing Industries  
1984 Annual Averages  
Waterbury Service Delivery Area

<u>Waterbury</u> <u>Service Delivery Area</u>	<u>Average</u> <u>Weekly</u> <u>Earnings</u>	<u>Average</u> <u>Weekly</u> <u>Hours</u>	<u>Average</u> <u>Hourly</u> <u>Earnings</u>
Total Manufacturing	\$342.17	43.7	\$7.83
Food	578.28	60.3	9.59
Textiles and Apparel	234.06	41.5	5.64
Chemicals, Rubber, Plastic Products	531.06	45.9	11.57
Primary Metals	462.62	48.8	9.48
Brass	504.44	50.8	9.93
Fabricated Metals	358.02	44.2	8.10
Machinery	368.47	45.1	8.17
Electrical Equipment	262.04	40.5	6.47
Instruments and Related Products	395.73	41.7	9.49
Other Manufacturing	300.42	41.9	7.17

Source: Current Employment Statistics Program

According to studies written by the Central Naugatuck Valley Regional Planning Agency, heavy industry is in decline in Waterbury; however, employment will shift toward employment in more diversified light manufacturing industries (particularly in electronic equipment) as well as expansion in the non-manufacturing sector. These new jobs will be in the retail trade and service sector, specifically in health services, business services, food stores, and eating and drinking establishments. An overall employment loss is not indicated here, merely a shift in the economic base of the area.

Population and Social Conditions

According to the 1980 Census, Waterbury has an approximate population of 103,266. This represents a decline of 4.4 since 1970. During this same period, however, the Central Naugatuck Valley Region experienced population growth at a rate of 6.4% and from 1980-1984 the region grew at a rate of 3%.

The overall growth of the region and the out migration from Waterbury has manifested itself in the rapid growth of neighboring suburban towns. For example, Southbury grew at an incredible rate of 80.3% between 1970 and 1980 while Oxford grew 48.1% <sup>1/</sup> during the same decade. Both towns are continuing to grow but at much less rapid rates during the 1980's.

Population projections show a gradual decline in Waterbury population from 1985 through 2000. This reflects a continuing trend toward suburbanization despite the availability of affordable housing in Waterbury through city revitalization efforts.

Table 5 compares population between Waterbury and 12 other municipalities between 1960 and 2000.

1/ Source: Profile of CNVR - Council of Governments, Central Naugatuck Valley, 1985.

Table 5

1960-2000 Population Figures and Projections for Central Naugatuck Valley Region

Municipality	1960	1970	1980	1985	1990	1995	2000	1960-70	1970-80	1980-1990	1990-2000
CNVR	195,512	223,211	237,385	243,800	250,900	257,100	262,500	14.2	6.4	6.4	5.7
Waterbury	107,130	108,033	103,266	102,000	100,800	100,000	99,200	0.8	-4.4	-4.4	-2.4
Remainder of Region	88,382	115,178	134,119	141,800	150,000	157,100	163,300	30.3	16.4	16.4	11.9
Beacon Falls	2,886	3,546	3,995	4,100	4,300	4,500	4,600	22.9	12.7	12.7	7.6
Bethlehem	1,486	1,923	2,573	2,900	3,200	3,500	3,700	29.4	33.8	33.8	24.4
Cheshire	13,383	19,051	21,788	23,200	24,500	25,300	26,100	42.4	14.4	14.4	12.4
Middlebury	4,785	5,542	5,995	6,200	6,400	6,500	6,600	15.8	8.2	8.2	6.8
Naugatuck	19,511	23,034	26,456	28,000	29,500	30,800	32,000	18.1	14.9	14.9	11.5
Oxford	3,292	4,480	6,634	7,900	9,200	10,600	11,900	36.1	48.1	48.1	38.7
Prospect	4,367	6,543	6,807	6,900	6,900	7,000	7,000	49.8	4.0	4.0	1.4
Southbury	5,186	7,852	14,156	15,800	17,600	19,200	20,700	51.4	80.3	80.3	24.3
Thomaston	5,850	6,233	6,276	6,300	6,400	6,500	6,500	6.5	0.7	0.7	2.0
Watertown	14,837	18,610	19,489	20,000	20,800	21,200	21,600	25.4	4.7	4.7	6.7
Wolcott	8,889	12,495	13,008	13,100	13,300	13,400	13,500	40.6	4.1	4.1	2.2
Woodbury	3,910	5,869	6,942	7,400	8,000	8,600	9,100	50.1	18.3	18.3	15.2
State	2,535,234	3,032,217	3,107,576	3,179,640	3,258,230	3,323,960	3,379,980	19.6	2.5	2.5	4.8

Source: Figures from 1970, 1980 U.S. Census Bureau. Population Projections from Central Naugatuck Valley Regional Planning Agency Memorandum 12188.

Table 6 compares selected population characteristics of Waterbury with the region.

Table 6 1/

	<u>Waterbury</u>	<u>Remainder of CNVR</u>	<u>Total<sup>1</sup> CNVR</u>
Number families headed by woman (no spouse)	6,693	4,450	11,143
Percentage:	17.6	9.9	13.4
Median Income			
Households:	\$14,865	\$18,897 <sup>b</sup>	\$18,587
Per capita income	\$6,450	\$7,649 <sup>b</sup>	\$7,557
Number below poverty level	14,258	6,075	20,333
Percentage:	14.1*	4.6	9.6
<u>Racial &amp; Ethnic Characteristics</u>			
White: number	86,263	131,675	217,938
% of total	83.5	98.2	91.8
*CNVR - Central Naugatuck Valley Region			
Black: number	12,023	1,316	13,339
% of total	11.6	.98%	5.6
Population of Spanish Origin: number	6,912	1,284	8,196
percentage	6.7%	.96%	3.5
Persons per gross acre:	5.57	.79	1.18

1/ All statistics compiled from Tables from CNVR Profile, 1985. Some percentages were calculated using figures from these tables. CNVR obtained these figures from the 1980 Census.

\* Ranked #1 percentage in a comparison with the 12 surrounding municipalities.

<sup>b</sup> Averages

The above chart shows that Waterbury is substantially poorer than the surrounding communities or the region as a whole. While the entire region has just under a 10% population living below the poverty level, this figure is heavily influenced by the proportion Waterbury contributes to the statistic. The percentage of population in Waterbury living under the poverty level is 14.1% compared with 4.6% in the 12 municipalities in the region, excluding Waterbury. In addition, both the household median income and per capita income for Waterbury are lower than the rest of the region. This comparison is useful in explaining the changes in land use in Waterbury over the last 5-10 years.

### Land Use

Any change in the use of land in a flood plain can effect flood control dramatically. For this reason, it is important to observe development trends in both Waterbury and Wolcott, which contain the flood basin.

### Waterbury

For the last several years, there has been pressure on Waterbury to develop land in the outlying areas of the city, closest to the suburbs. In addition, this development has been directed toward multi-unit residential building, particularly apartment and condominium development.

According to the Connecticut State Department of Housing, Waterbury led the State in the number of new housing units authorized for construction during 1985 with a total of 999 units approved. Many zoning changes occurred in Waterbury between 1980 and 1983 converting low density residential zones (single family housing) into higher density residential zones. This enabled Waterbury land developers to capitalize on the rapidly growing demand for smaller more affordable housing units. The overwhelming majority of the 999 units authorized to be built during 1985 were condominium units. Many of these units were sold to people from outside Waterbury and its suburbs.

The Office of City Planning in Waterbury cites several reasons for such rapid development. First, real estate prices in all of the suburbs of Waterbury have sharply increased over the last decade. Growth in these areas is restricted because of large minimum lot requirements so as demand grows the price is bid up on the limited supply of lots and homes. For example, in 1980 the median price of a home in Oxford was \$78,000, in Southbury it was \$82,600, and in Woodbury \$86,500.<sup>1</sup> Each of these figures represents an increase of over 200% since 1970.

<sup>1</sup>Median Value of Specified Owner Occupied Housing Units in CNVR by Municipality 1960-1980, Table III E1: Profile CNVR, 1985

A second reason cited is the growing demand for housing generated from outside the Waterbury region, specifically from Danbury and lower Fairfield county. The Waterbury area is now more accessible to these regions because of improvements in the highway system. Over the past decade, Waterbury has experienced an out migration of its population to the nearby suburbs. It is hoped by city government officials that condominium development will attract population back into Waterbury broadening its tax base.

The higher cost of housing has also increased demand for apartment units. Waterbury has a larger proportion of renter occupied units than the surrounding municipalities. A report written by the Central Naugatuck Valley Regional Planning Agency states:

"53% of Waterbury's units were renter occupied in 1980, while 21% were in the suburban portion of the CNVR. The suburban towns with the greatest proportion of rental housing were Naugatuck (35%), Woodbury (33%), and Thomaston (29%). Prospect, Wolcott, Southbury, and Middlebury had the least with only 9 to 11% of their occupied units being rented. Prospect and Wolcott both showed a decrease in rental housing over the last decade."<sup>1</sup>

The Waterbury Planning Office reports that many commercial and industrial zone changes are being prompted by this high demand for residential property. There have been sections of land zoned for commercial or industrial park use that have been rezoned for moderate density residential building. A higher level of return in a shorter time period can be realized from such residentially zoned property in Waterbury than it can for industrial or commercial use at the present time.

Land use along the Mad River between Frost Road and Sharon Road reflects this trend toward higher density residential development with 477 of the 498 residential units being apartment and condominium units. Almost all land in the study area has been built upon at this time.

#### Wolcott

In Wolcott, land use is more restricted because of the limited number of sewer lines and the lack of a water network within the town. A moratorium on multi-family housing has been voted in changing the regulation on minimum plot size from 5 acres to 15 acres for apartments and condominiums and only where there are existing sewers. The bulk of residential property in Wolcott is zoned for single family or duplex homes with a lot requirement of 1-1/2 acres.

<sup>1</sup>Profile of CNVR

Some of the Mad River basin area is zoned for industrial park usage and there is also a long strip alongside the river zoned for commercial use. This area remains largely underdeveloped, but there is a great deal of speculation that some industrial park land could be rezoned for residential use. At the present time, however, there have been few applications for building in this area. Wolcott's zoning officer has indicated that development will most probably be very slow and highly restricted because of the town's absence of an adequate municipal infrastructure to facilitate population expansion at this time.

Table 7 is a summary of proportionate land use by category in both Waterbury and Wolcott.

Table 7

Land Use in Waterbury and Wolcott, Connecticut  
Acres and Percentage of Zoned Land

	<u>Waterbury</u>		<u>Wolcott</u>	
	Acres	Percent	Acres	Percent
Residential	5,753	31.	2,697	19.9%
Manufacturing	879	4.7	137	1.0
Trades and Services	984	5.0	243	2.0
Cultural, Entertainment and Recreation	680	3.7	111	.8
Transportation, Communi- cations and Utilities	575	3.1	220	3.1
Agriculture	62	.3	419	3.1
Resource Production and Extraction	149	.8%	209	1.5
Underdeveloped, Unused, Reserved Water Areas	9,473	51%	9,493	70.1%
Total	18,555	100%	13,529	100%

Source: Central Naugatuck Valley Regional Planning Office

Economic Analysis

Methodology

This economic study is based on procedures accepted by the U.S. Army Corps of Engineers for evaluating benefits and costs to national economic development (NED). They are used here specifically to establish the most efficient use of Federal and local funding in reducing flood losses to the Woodtick area. Three alternative plans are evaluated in this analysis. Procedures and regulations for the above have been established in the following referenced document:

U.S. Army Corps of Engineers, Planning Guidance Notebook, Regulation No. 1105-2-40 Planning - Economic Considerations, Section IV - NED Evaluation Procedures: Urban Flood Damage.

The economic analysis is accomplished by first determining the economic justification for each alternative plan. Benefits and costs are made comparable by conversion in an equivalent annual basis using a rate of interest (8 5/8%) employed in the evaluation of all Federal water resource projects. Costs and benefits are then expressed as average annual amounts over the duration of the project life which is 50 years. All dollar values are expressed in 1985 prices. If a project is economically justified, then annual benefits should equal or exceed annual costs. Finally, net benefits (benefits minus costs) for each alternative are calculated and compared. The alternative yielding the highest net benefit figure is considered the most efficient plan for allocating Federal and local resources.

Without Plan Conditions

Flood Damages

As stated earlier, the specific area where flooding occurs is a one mile section of the Mad River between Frost Road Bridge and Sharon Road. There is substantial development along both sides of the river in the study area with a total of 502 dwelling units contained in 55 buildings; 477 of these are apartment and condominium units (see Table 1).

Under the existing area of development, a flood event similar to the June 1982 event would cause an estimated \$2,168,000 in flood losses to the study area.

The June 1982 flood was estimated to have a peak discharge of 3,500 cubic feet per second (cfs) at the Mad River Dam located about 4,000 feet downstream of Frost Road Bridge. This is estimated to be a 70 year frequency flood. Peak flows for the 100 year frequency flood were estimated at 4,000 cfs.

A 1978 Flood Insurance Study which was the basis for Waterbury's participation in the National Flood Insurance program, divided Waterbury into specific flood hazard zones. Most of the study area was given a designation of A5, a classification as a Special Flood Hazard Area (SFHA) susceptible to inundation by the 100-year flood. The remaining portion of the study area is classified as a zone B and lies further back and at higher elevations between the limits of the SFHA and the 500-year floodplan.

Basically, the history of development along the study area involves more intensive land use on the river channel over the last 15 years. The 1971-72 construction of the Naugatuck Valley Mall on low lying wetlands adjacent to the river was the first commercial development to be placed in



the area. The Mall, however, is not actually in the study area. Royal Crest Estates, a large apartment complex, also adjacent to the river, was built a few years later. During construction of this complex, 1,000 feet of the channel was widened and straightened to 50 feet.\* Valley Mall Manor, a group of 7 buildings providing housing to the elderly, was also built at this time at one of the lowest lying portions of the river (in reach 2). Finally, there has been a proliferation of condominium and apartment construction on land bordered by the Mad River, Woodtick Road, Sharon Road, and Prescott Terrace.

The June 1982 flood caused considerable damage to residential property. Sharon Road Bridge was closed to traffic and 100 elderly people were evacuated from low lying Valley Mall Manor. Damages from flooding and seepage. Many single family units and some multiple family units received damages to basements including heating systems and stored items. Most of the multiple family units received the worst damage because they are without basements (constructed on foundation slabs) and first floor damage occurred to carpentry, appliances and furniture.

#### Damage Survey

A damage evaluator from the New England Division of the Corps of Engineers conducted a survey of damages to properties lying within the flood region. He inspected properties and interviewed the property owners and/or managers to estimate dollar amount damages associated with the June 1982 flood.

This survey was added to in December 1985 and 3 more buildings were included. Damage estimations were based on the previous survey and were adjusted according to the distance from the river and elevation of the site.

In addition to the figure for direct damage to structures, estimated losses attributable to temporary relocation were added in for apartments and condominiums. This procedure was followed to list damages in 1 foot increments for a flooding range of 3 feet above and 4 feet below the level of the June 1982 flood.

The survey showed that for a flood similar to June 1982 an estimated 2.6 million dollars in damages would be incurred collectively for 143 apartment units, 80 condominium units, 16 single-family residences, 1 commercial building, and 3 light industrial concerns. Commercial and industrial losses were less than 2% of total losses. No damage to public property occurred nor is any anticipated over the assumed range of flooding.

\*Reconnaissance Report - Local Flood Protection, Mad River, Waterbury, Connecticut, November 1983; Army Corps of Engineers NEDPL-PS

Average Annual Damages W/O Plan

Index Station #1	\$2,600
Index Station #2	22,100
Index Station #3	195,900
	<u>\$220,600*</u>

Average Annual Damages W Plan

Alternative A

Channel Improvements

Index Station #1	300
Index Station #2	1,100
Index Station #3	38,800
	<u>40,200</u>

Average Annual Benefits

Alternative B

Damages W/O Plan  
Damages W Plan

Local Improvements

Index Station #1	300
Index Station #2	3,300
Index Station #3	74,900
	<u>78,500</u>

Sample calculation:

Alternative 1	
W/O Plan	220,300
W Plan	78,500
	<u>141,800</u>

Alternative C

Levees and Floodwalls

Index Station #1	
Index Station #2	
Index Station #3	43,200
	<u>43,200</u>

Alternative A - Channel Improvements

Represents an 82% reduction in expected flood damages over the natural condition.

Alternative B - local Improvement

Represents 64% reduction in expected flood damages over the natural condition.

Alternative C - Levees and Floodwalls

Represents an 80% reduction in expected flood damages over the natural condition.

### Recurring Losses

Recurring losses are those potential flood damages which are expected to occur at various flood stages given present land development in the flood plain. The damage survey is used to produce an array of dollar value losses corresponding to each elevation of flooding (in 1 foot increments). These flooding elevations are displayed according to their probability of occurrence using either a 100-year event or an historical flood measured in the recent past, as a starting point. These frequency losses are computed for each zone of the study area. Table 7 shows the relationship of probability of occurrence to expected flood losses.

\*All figures rounded

Table 8

Mad River, Waterbury, Connecticut (Woodtick)  
Relationship of Probable Flood Events to  
Expected Flood Losses  
(in \$1,000's)

<u>Zone</u>	200 yr Event (.5%)	100 yr Event (1%)	50 yr Event (2%)	25 yr Event	10 yr Event	5 yr Event
Reach #1	93	56	37	10	7	3
Reach #2	1500	675	150	3	2	1
Reach #3	5772	3068	1515	716	265	135
Total	7365	3799	1702	729	274	139

Annual Losses

Annual losses are obtained using the above information. Expected annual figures are calculated by averaging damage figures between 2 probability intervals and multiplying this average by the difference between the same two intervals.

The potential annual damages are the summation of all the expected values in the "annual damages" column for each flood zone (or reach). The Woodtick area is divided into 3 flood elevation zones. These three sections comprise one quarter, one half and one quarter of the river in the study area. Flood zone #3, which is 560' downstream from Sharon Road Bridge incurs almost 90% of the total "expected" annual damages of the study area (195,900) annually). The total potential losses for the Woodtick area are \$220,300. Table 9 illustrates the calculations used to obtain annual losses for one flood zone.

Table 9

Sample Calculations for Annual  
Damages in Flood Zone #3

<u>% of Chance</u>		<u>Frequency in years</u>		<u>Damages (in \$1000's)</u>		<u>Annual Damages(\$)</u>
.05 (.0005)		2,000		11,730		
(.002-.0005)	=	(.0015)	x	11,730	=	\$17,595
.20 (.002)		500		11,730		
(.0025-.002)	=	(.0005)	x	11,033	=	5,517
.25 (.0025)		400		10,335		
(.005-.0025)	=	(.0025)	x	8,054	=	20,134
.50 (.005)		200		5,772		
(.01-.005)	=	(.005)	x	4,420	=	22,100
1.00 (.01)		100		3,068		
		(.0025)	x	2,883	=	7,208
1.25 (.0125)				2,698		
		(.0025)	x	2,513	=	6,283
1.5 (.015)				2,328		
		(.0050)	x	1,921	=	9,608
2.0 (.02)				1,515		
		(.01)	x	1,240	=	12,400
3.0 (.03)				965		
		(.01)	x	841	=	8,410
4.0 (.04)				716		
		(.01)		620	=	6,200
5.0 (.05)				524		
		(.05)	x	394	=	19,725
10.00		10		265		
		(.10)	x	200	=	20,000
20.00		5		135		
		(.10)	x	110	=	11,000
30.00		3 1/2		85		
		(.10)	x	77	=	7,700
40.00		2 1/2		69		
		(.10)	x	65	=	6,500
50.00		2		61		
	.10					
60.00		1 2/3				
	.20	(.5)	x	31	=	15,500
80.00		1 1/4				
	.20					
100.00		1		0		
				Total		\$195,877 *

\*Rounded to 195,900 in calculations

## With Plan Condition

### Alternative Flood Improvement Plans

There have been three plans established by the Plan Formulation Branch for improving flooding conditions in the study area. Plans A and B both employ channel modifications to increase the capacity of the river in order to lower flooding elevations. Plan C would use a flood wall to protect a specific reach of the Mad River against flooding elevations up to the level of a 100 year flood.

#### Plan A

##### Channel Modifications

Modifications made to one mile of channel from Sharon Road downstream to just below Frost Road. This would provide improved protection to the entire study area.

#### Plan B

##### Localized Channel Modifications

Modifications would involve widening the existing channel along two areas of the Mad River totaling 1,270 linear feet. These areas have been determined to be the most restricted areas in the reach and are located in the vicinity of Frost Road Bridge near Boufford Avenue.

#### Plan C

##### Levees and Floodwalls

Construction of a floodwall from Sharon Road Bridge downstream for a distance of 1800 feet. Would protect properties within this reach against a level of flooding caused by a 100 year event.

##### Benefit Analysis

Benefit analysis attempts to measure the net contributions to national economic development (NED) associated with each alternative plan for flood protection in the Woodtick study area. Urban flood benefits can be calculated in three categories:

1. Inundation reduction benefits - are calculated on the basis of increased income to existing operations from a reduction in costs and damages.

2. Intensification benefits - calculated on the basis of increased income to the area if the floodplain improvements help to increase or intensify the operations of existing industries (businesses).
3. Location benefits - are calculated on the basis of increased income to the area (including rent) if floodplain improvements increase economic activity in the area (i.e. add new business).

Intensification and location benefits were excluded as benefit categories here because no new or expanded land use is anticipated as a result of any of the improvement plans.

Inundation benefits can be calculated in the following categories:

1. reduction in flood damages
2. reduction in flood insurance overhead

Reduction in flood damages - An event similar to the June 1982 flood would cause an estimated \$220,600 in physical and non-physical damage to property in the study area. These losses would be incurred primarily by owners of residential property. Average annual benefits for each plan would be the difference between annual damages without a plan, or \$220,600, and any residual damages associated with each alternative. See Table 10.

#### Reduction in flood insurance overhead

A national cost of the flood insurance program is its administration. Overhead costs include the average cost per policy, agent commission, and cost of servicing and claims adjusting. National benefits accrue from the savings associated with the reduced number of flood insurance policies carried after implementation of a flood protection plan. Savings for each alternative are calculated by multiplying the overhead cost per policy (\$51.00)\* by the number of units inundated (1982 is used) adjusted by the reduction factor associated with each plan (see page 2-16).

#### NFIP overhead savings:

##### Alternative A - Channel Improvements

243 units x 51.00 x .82 = \$10,162 Rounded to \$10,200.

##### Alternative B - Local Improvements

243 units x 51.00 x .64 = \$7932 Rounded to \$7,900.

##### Alternative C - Levees & Floodwalls

243 units x 51.00 x .80 = \$9914 Rounded to \$9,900.

\*Based on 1984 FEMA figures. 1985 figures were not yet available.

Table 10

Mad River, Waterbury, Connecticut - Woodtick Area

Annual Benefits for Alternative Flood Protection Plans

<u>Alternative Plans</u>	<u>Average Annual Damages Without Plans</u>	<u>Average Annual Damages With Plan</u>	<u>Average Annual Benefits</u>	<u>NFIP Overhead Savings Benefit</u>	<u>Total Benefits</u>
Natural Condition	\$220,600				
A. Channel Modifications		\$40,200	\$180,400	\$10,200	\$190,600
B. Localized Channel Modifications		\$78,500	\$142,100	\$7,900	\$150,000
C. Levees and Floodwalls		\$43,200	\$177,400	\$9,900	\$187,300



## Annual Costs

Table 11 summarized the calculations for total annual cost under each plan alternative by category. Annual maintenance and interest during construction are included in addition to first costs. First costs include contingencies and costs of engineering design, supervision and administration. First costs range from \$1,055,000 (for localized modifications) to \$2,200,000 (for levees and floodwalls).

Table 11

Mad River, Waterbury, Connecticut - Woodtick Area  
Annual Costs of Alternative Flood Protection Plans

### Alternative Plans

<b>A. Channel Modification</b>		
(1) First Cost	1,700,000	
(2) Interest During Construction	47,300	
(3) Investment Cost		1,747,300
(4) Interest Plus Amortization 50 yrs. @ 8-7/8%	157,300	
(5) Annual Maintenance Cost	5,000	
(6) Total Annual Costs		162,300
<b>B. Localized Channel Modifications</b>		
(1) First Cost	1,055,000	
(2) Interest During Construction	28,500	
(3) Investment Cost		1,083,500
(4) Interest Plus Amortization (50 yrs @ 8-7/8%)	97,500	
(5) Annual Maintenance Cost	2,000	
(6) Total Annual Costs		99,500
<b>C. Levees and Floodwalls</b>		
(1) First Cost	2,200,000	
(2) Interest During Construction	61,400	
(3) Investment Cost		2,261,400
(4) Interest Plus Amortization (50 yrs @ 8-7/8%)	203,600	
(5) Annual Maintenance	4,000	
(6) Total Annual Costs		207,600

NOTE: First costs will be updated for Alternatives A through C to reflect current real estate costs based on existing market conditions.

### Economic Evaluation and Conclusion

Table 12 summarizes the benefits and costs of each alternative flood plan for the Woodtick study area. All three plans meet the criteria for economic feasibility, as each plan has a benefit cost ratio greater than one. The plan selected is the one exhibiting the highest net benefits (benefits minus costs) and therefore, maximizes economic efficiency to national economic development (NED).

Plan B, localized channel modifications, represents the highest annual net benefits to be obtained from a flood control project in the Woodtick area with an annual net benefit of \$50,500.

Table 12

Mad River, Waterbury, Connecticut - Woodtick Area  
Economic Evaluation

Alternative Plans	Annual Benefits	Annual Costs	Benefit-Cost Ratio	Net Benefits
A. Channel Modifications	190,600	162,300	1.2	28,300
B. Localized Channel Modifications	150,000	99,500	1.5	50,500
C. Levees & Floodwalls	187,300	207,600	.90	Negative

**SECTION 3**  
**GEOTECHNICAL STUDIES**

APPENDIX 3

GEOTECHNICAL STUDIES

## TABLE OF CONTENTS

<u>Subject</u>	<u>Page No.</u>
1. PERTINENT DATA	3-1
a. Purpose	3-1
b. Location	3-1
c. Design Storm	3-1
d. Walls	3-1
e. Channel Widening	3-1
2. INTRODUCTION	3-1
a. Project Description	3-1
b. General	3-2
c. Elevations	3-2
3. TOPOGRAPHY, GEOLOGY AND SEISMICITY	3-2
a. Topographic Features	3-2
b. Geologic Features	3-2
c. Seismicity	3-2
4. SUBSURFACE INVESTIGATIONS	3-3
a. Subsurface Explorations	3-3
b. Presentation of Data	3-3
5. CHARACTERISTICS OF WALL AND CHANNEL FOUNDATION MATERIALS	3-3
a. General	3-3
b. Groundwater	3-3
c. Shear Strength	3-4
d. Permeability	3-4
e. Consolidation	3-4
6. REQUIREMENTS OF WALL AND CHANNEL MATERIALS	3-4
a. General	3-4
b. Design	3-4
c. Random Fill	3-5
d. Gravel Fill and Bedding	3-5
e. Stone Bedding	3-5
f. Stone Protection	3-6
7. DESIGN AND COST CONSIDERATIONS	3-6
a. Channel Protection	3-6
b. Walls	3-7
c. Sources of Materials	3-7
d. Environmental	3-7
e. Construction	3-7
f. Dewatering	3-7
g. Placement and Compaction	3-7
h. Disposal	3-8
i. Utilities	3-8

## PLATES

<u>No.</u>	<u>TITLE</u>
2-1	General Plan
2-2	Plan No. 1
2-3	Plan No. 2
2-4	Proposed Gradations

## APPENDICES

<u>No.</u>	<u>TITLE</u>
2-1	Associated Borings Co., Inc. Exploration Logs
2-2	The Haller Testing Labs, Inc. Exploration Logs

## 1. PERTINENT DATA

- a. Purpose  
Flood Control
- b. Location  
State - Connecticut  
County - New Haven  
City - Waterbury
- c. Design Storm  
Flow - 4000 cfs  
Freeboard - 2.0 feet (walls)  
              - 2.5 feet (stone protection)
- d. Walls  
Top of Wall Elevation - 460.0 NGVD  
Batter - 6V on 1H  
Total Length - 420 feet
- e. Channel Widening  
Existing width - 30 feet  
Proposed width - 50 feet  
Length - 1130 feet  
Depth of Excavation - 0 feet (along centerline of existing channel)  
Side Slopes - 1V on 2H

## 2. INTRODUCTION

### a. Project Description

The purpose of the project is to significantly decrease the probability of flood damages to residential property adjacent to the Mad River in Woodtick (North Waterbury), Connecticut. The Mad River is situated in central Connecticut as shown on Plate 2-1. It originates at the outlet of Cedar Swamp Pond in Wolcott, Connecticut and flows south-westerly approximately nine miles to its confluence with the Naugatuck River in Waterbury, Connecticut. The terrain adjacent to the Mad River slopes gently up to rolling hills.

The proposed modifications to the Mad River are 440 feet of channel widening near the Royal Crest Apartments and an additional 710 feet of channel widening near Frost Road Bridge. Stone protection will be constructed to protect river bank slopes in critical areas from erosion. Precast concrete Modular Wall sections will be used to protect structures and pavements where there is not enough space to use stone protection. Surface water run-off that collects behind the retaining walls will be handled by sloping and grading the backfill so that the water flows around the end of the walls and into the river.

#### b. General

Geotechnical engineering studies were performed to further the continued planning of structural improvements within the Mad River Basin. Available subsurface and geologic information was collected and used to assign conservative geotechnical design parameters. Safe and economical foundation designs, channel protection schemes and excavation methods were developed from the geotechnical parameters.

#### c. Elevations

All elevations mentioned in this report are in reference to the National Geodetic Vertical Datum (NGVD), which is the mean sea level of 1929.

### 3. TOPOGRAPHY, GEOLOGY AND SEISMICITY

#### a. Topographic Features

The project area is located about 2.5 miles east of Waterbury, Connecticut in the New England Upland Section of the New England physiographic province. The topography as seen on the U.S.G.S. Waterbury quadrangle map is generally characterized by broad valleys and smooth hills.

The project concerns a flood-prone section of the Mad River approximately 1 mile in length between Sharon Road and a point about 600 feet south of Frost Road Bridge. At the upstream limit of the project the river flows through a plain which has elevations of about 460 to 470 feet and is about 1 mile broad. The surrounding hills are about 600 to over 800 feet in elevation. Near the Frost Road crossing the river valley becomes constricted. The normal channel is confined between the 400 foot contours which are less than 50 feet wide in places.

#### b. Geologic Features

Bedrock in the project vicinity is the Precambrian Waterbury Gneiss, a resistant metamorphic rock type. Rock is exposed mainly at the peaks and sides of the higher hills. Most of the area is covered by glacial deposits. Till is widespread over broad areas. Valleys are filled with assorted water laid deposits of sand and gravel and sometimes silt and clay formed by glacial meltwaters during retreat of glacial ice from the region.

Within the project limits, the Mad River channel is primarily in thick flood plain deposits consisting of recent alluvial silts and sands with organic matter and scattered gravels and boulders. Alluvial deposits may overlie glacial till in places. Bedrock is probably as much as 80 feet deep below the flood plain but becomes shallower near hills.



c. Seismicity

According to the map in ER 1110-2-1806, the project site is located in seismic zone 2. The corresponding seismic coefficient is 0.10. The seismic coefficient method shall be used to determine the sliding and overturning stability of all concrete structures.

4. SUBSURFACE INVESTIGATIONS

a. Subsurface Explorations

Subsurface explorations were not executed for the Detailed Project Report. Subsurface information was obtained from the city of Waterbury for explorations performed in connection with a proposed second Mad River interceptor and for the reconstruction of Frost Road Bridge.

Three borings (7,8 and 9) were conducted by Associated Borings Co., Inc. August 6-8, 1984 to aid Malcolm-Pirnie, Inc. in the design of a second Mad River interceptor. Each exploration was terminated at 15 feet of depth and was situated within 100 feet of the USACE proposed channel modifications. Splitspoon sample and standard penetration tests were generally taken at 5-foot intervals.

The Haller Testing Labs, Inc. executed four explorations (B-1 to B-4) April 1965 to aid John Clarkson-Consulting Engineer, in the design of the existing Frost Road Bridge. The borings were located at each of the four corners of the bridge and were terminated at depths varying from 23.5 to 41.5 feet. Splitspoon samples were taken at 5-foot intervals or at each change in soil type, whichever occurred first. Coring was performed when required to advance the boreholes through boulders and to confirm bedrock in boring B-1.

B. Presentation of Data

Locations of the subsurface explorations are shown on Plates 2-2 and 2-3. Logs of the explorations are contained in Appendices 2-1 and 2-2.

5. CHARACTERISTICS OF WALL AND CHANNEL FOUNDATION MATERIAL

a. General

The nature of the foundation materials at the project site was studied by reviewing geologic maps, boring logs and a field reconnaissance by USACE personnel. The subsurface materials are stratified, gravelly Sands (SW) and gravelly, silty Sands (SP,SM) with cobbles and boulders. A thin layer (0.5 feet) of surficial topsoil covers the sand outside of the Mad River channel. Standard penetration test results from 3 to greater

than 50 indicate that the sand varies from very loose to very dense. The loose test results were all noted within 2 feet of the ground surface. The test results greater than 50 were probably caused by the existence of cobbles and boulders.

b. Groundwater

Groundwater was observed in the bore holes at elevations from 446 to 456 feet during the two exploration programs. The groundwater should fluctuate with the level of the Mad River in the proposed construction areas due to the closeness of the river and the pervious nature of the subsurface soils. It must be noted that groundwater elevations will vary from those observed because of variations in rainfall, snow, ice, temperature, stabilization time, or other factors which differ from the conditions present at the time that the observations were made.

c. Shear Strength

The foundation materials for the proposed project were not tested for shear strength. A friction angle ( $\phi$ ) of 30 degrees and a cohesion (c) of 0 pounds per square foot are the estimated shear strength parameters for the gravelly Sands and the gravelly, silty Sands. The estimate was based on standard penetration test data, information on exploration logs, and experience with similar materials.

d. Permeability

Permeability tests were not performed on samples of the foundation soils. It is estimated that the coefficient of permeability will be greater than  $10^{-4}$  centimeters per second in the gravelly Sands and the gravelly, silty Sands. The permeability estimate was a judgement based on boring log information and experience with similar soils.

e. Consolidation

The consolidation characteristics and natural densities of the granular foundation soils encountered are such that no significant post-construction foundation settlement is anticipated under the proposed loadings. All soft and compressible deposits will be removed prior to the placement of stone protection layers or construction of walls.

6. REQUIREMENTS OF WALL AND CHANNEL MATERIALS

a. General.

Some of the materials from the required excavations will be suitable for random fill and stone protection. The contractor will reuse the suitable excavated materials to the extent practicable and furnish the remaining materials from off-site sources.

b. Design

The gradation requirements for gravel fill, gravel bedding, stone bedding and stone protection materials have been established in accordance with criteria set forth in Engineering Manual for Civil Works Construction, EM 1110-2-1901, Soil Mechanics Design, Seepage Control, and Engineering Technical Letter for Civil Works Construction, ETL 1110-2-120, Engineering and Design, Additional Guidance for Riprap Channel Protection. Proposed gradations for the gravel fill, gravel bedding, stone bedding and stone protection are shown on Plate 2-4. On the basis of the gradations shown on Plate 2-4, it is estimated that gravel fill, gravel bedding and stone bedding will develop friction angles ( $\phi$ ) of at least 30 degrees and will have coefficients of permeability between  $10^{-3}$  and  $10^{-2}$  centimeters per second.

c. Random Fill

The material from the required excavations will be gravelly Sands and gravelly, silty Sands. It is planned to use the excavated material as random fill below stone protection, gravel bedding layers and as backfill behind walls. Random fill material will not contain significant quantities of cinders, ashes, topsoil, stumps, trash, debris, and other deleterious material.

d. Gravel Fill and Bedding

Gravel fill and bedding will consist of approved contractor furnished well-graded, sandy gravel composed of tough, durable particles of natural sand and gravel. The material will meet the following gradation limits:

<u>Sieve Size</u> <u>(U.S. Standard)</u>	<u>Percent Passing</u> <u>by Dry Weight</u>
1 1/2" (max)	100
3/4"	45-80
1/4"	25-60
No. 10	15-45
No. 40	5-25
No. 100	0-10
No. 200	0-5

e. Stone Bedding

Material for stone bedding will consist of quarried rock, composed of hard, durable, angular and sound rock fragment furnished by the contractor. Stone bedding material will meet the following gradation limits:

<u>Sieve Size</u> <u>(U.S. Standard)</u>	<u>Percent Passing</u> <u>by Dry Weight</u>
8" (max)	100
5"	80-100
2"	0-15
1" (min)	0

f. Stone Protection

Stone protection materials will consist of hard, durable and sound quarried rock fragments not less than 162 pounds per cubic foot furnished by the contractor. They shall meet the following gradation and size requirements:

<u>Limits of</u> <u>Stone Weight (pounds)</u>	<u>Percent Lighter by</u> <u>Weight</u>
Between 400 and 1,000 (max.)	100
Between 200 and 300	50
Between 60 and 150	15
2 (min.)	0

7. DESIGN AND COST CONSIDERATIONS

a. Channel Protection

The need for protection due to the increased channel velocities in the Mad River that would occur from the proposed project modifications was studied. Procedures outlined in the Engineering Manual for Civil Works Construction, EM 1110-2-1601, Engineering and Design, Hydraulic Design of Flood Control Channels were used to calculate stone layer thickness and sizes within the proposed project limits. Local turbulence due to bends and bridge abutments was taken into account in the design of stone protection sections. Plates 2-2 and 2-3 show typical stone protection sections and areas where they are required within the proposed project limits.

The Army Corps of Engineers would construct the required stone protection within the project limits. Local interests would be required to construct any required stone protection outside of the project limits. Considering the size and nature of the proposed project, it is unlikely that any additional stone protection will be needed outside of the project limits.

b. Walls

Precast Concrete Modular retaining walls will be constructed downstream of Frost Road Bridge where structures and pavements are situated too near the Mad River to be protected by stone. The footings for the retaining walls will rest on natural, undisturbed, gravelly Sands and gravelly, silty Sands which have an allowable bearing capacity of 6,000 pounds per square foot. The backfill zone immediately behind the walls will be gravel and will slope down towards the downstream end of each reach of wall to handle surface run-off.

c. Sources of Materials

Stone up to 1000 pounds will be required for channel and toe protection. Stone quarries are located in the towns of Beacon Falls, Meridan, Plainville and Woodbury at distances ranging from 9 to 11 radial miles from the site. Gravel and concrete materials are available locally in Waterbury.

d. Environmental

The Mad River bottom provides spawning habitat for many species of fish. The proposed project will not significantly alter the existing bottom of the river. Therefore, provisions for restoring existing pools and riffles are not envisioned at this time. However, slight modifications to the proposed cross sections may be made during plans and specifications to ensure that an adequate low flow channel remains for fish migration.

e. Construction

Construction will be performed during the low flow season (June to December). Water depths in the river are typically 0 to 2 feet during the low flow season. Therefore, it is assumed that excavation can be performed using tracked bulldozers, hydraulic excavators, and front-end loaders working from within the channel and on top of the channel banks.

f. Dewatering

All areas where walls are to be constructed will be dewatered. It is anticipated that the dewatering can be accomplished using open pumping and if necessary small gravel cofferdams. Dewatering will not be required for placement of stone protection and underlying filter layers.

g. Placement and Compaction

Compacted fill materials will be spread by bulldozers, other approved equipment or by hand to form uniform loose layers not greater than 8 inches in thickness. Loose random fill layers shall be compacted to 90 percent of AASHTO T-180, Method D. Loose gravel fill layers shall be compacted to 95 percent of AASHTO T-18, Method D. Layer thickness will be decreased, if necessary, in restricted areas (areas where heavy equipment is not allowed) to attain the required percent compaction.

h. Disposal

The contractor will be responsible for disposing of excess excavated materials. The excavated materials will mainly consist of gravelly Sands (SW) and gravelly, silty Sands (SP,SM). The excavated material shall be temporarily stockpiled and allowed to drain before it is transported. It is estimated that approximately one day will be sufficient time to dewater the excavated material.

i. Utilities

An existing sewer interceptor crosses the proposed project limits at two locations. A second sewer interceptor is presently being designed which will cross the project limits at two locations. Plans provided by the city of Waterbury indicate that the sewers are buried deep enough so they will not be adversely affected by the project.

Several concrete storm drain outlets empty into the Mad River within the project limits. Stone protection will be used to protect the outlets from erosive forces.

**PLATES**

APPENDIX 2-1

ASSOCIATED BORINGS CO., INC.

EXPLORATION LOGS



# TEST BORING REPORT

BORING NO. 7  
LINE & STA. \_\_\_\_\_  
OFFSET 10.0 Westerly  
GR. ELEV. 457.2  
DATE August 6, 1984

BORING NO. 8  
LINE & STA. \_\_\_\_\_  
OFFSET 19.0 North of Bridge, South of Pol  
GR. ELEV. 458.1 #F7202  
DATE August 8, 1984

A				DENSITY OR CONSIST.		BLOWS PER 6" B		A				DENSITY OR CONSIST.		BLOWS PER 6" B	
STRATUM DESCRIPTION								STRATUM DESCRIPTION							
0.2		Topsoil	Loose	4-2		0.3		Topsoil	Dense	2-50					
		Br. M-F Silty Sand, some M-F Grav., Cobbles. Boulders.	Dry	3				Br. M-F Sand, some M-F Grav., Cobbles, Boulders.	Dry						
		"	M. Comp	11-10		5.5			Dense	50/2"					
			Dry	9				Dark Br. M-F Sand & C-F Grav., Contiguous Cobbles, Boulders	Dry						
						10.0									
11.0		"	Dense	14-50/0"		11		Cored Boulder Recovery: 26"							
		Br. C-F Sand, some C-F Grav., Cobbles.	Moist	9		12.5									
			Comp.	14-32				Dark Br. M-F Sand & C-F Grav., Contiguous Cobbles, & Boulders.							
15.0			Wet			15.0									
		End of Boring-15.0						End of Boring- 15.0							
		GWO-11.0						GWO- 9.0							
								Note:							
								Augered to 15.0							

- 1 COL. A Blows on Casing # DRILL TIME PER FOOT  
2 COL. B Blows on 1 3/4" Sampler (I.D.)  
3 HAMMER = 140 #, FALL 30"  
4 SAMPLER = O. D. SPLIT SPOON  
5 GWO = GROUND WATER OBSERVATIONS

FIELD — % CONTENT

AND	— 40 to 50%
SOME	— 10 to 40%
TRACE	— 0 to 10%



APPENDIX 2-2

THE HALLER TESTING LABS, INC.

EXPLORATION LOGS

NOTES:

1. Spoon blows per 6" on 2" sampler using 140 lb. weight falling 30 inches.
2. Casing blows per foot on 2 1/2" coring using 300 lb. weight falling 24 inches.
3. Borings taken April, 1965.
4. Borings taken for purposes of design and show conditions at boring points only, but do not necessarily show the nature of materials to be encountered in connection with the construction of the bridge.
5. Water levels indicated were those observed on the dates the borings were taken and may vary.
6. Borings taken by "The Haller Testing Labs, Inc."
7. Borings indicated thus ● B-1.
8. Boring samples will be kept at the office of John Clarkeson-Consulting Engineer, West Main Street, Waterbury, Conn.

# BORING B-1

Reference Line  
Elev. = 456.76

Ground Elev. = 453.13

Ground Water  
Elev. = 451.2'

Bottom of Culvert  
Slab Elev. = 447.58

Casing Depth Blows /Ft.	Classification of Material	Blows on Sampler			Sample No.
		0-6"	6-12"	12-18"	
3	Brn. C. -M.F. + Sand and Silt, Little	1	2	1	1
3	C.M.F. Gravel, tr. roots (wet)	2	1	2	2
2	3.0'				
1	Dark-brn Organic Silt and C.-M.F. + Sand	3	5	44	3
35	trac. C.M.F. Gravel (wet)	Boulders			
72	Boulders				
100	Brn. C.M.F. Sand and Silt, Little C.M.F.	24	24	22	4
64	Gravel, pcs. of Boulders (wet)	31	44	17	5
32	9.5'				
10	29	12	17	13	6
24	Brn. C.M.F. Sand, some C.M.F. Gravel,	6	12	8	7
35	Little Silt, pcs. of Boulders (wet)				
38	10.5'	13	15	12	
31	Gray-brn. C.M.F. + Sand, some C.M.F.	10	14	13	8
30	Gravel, Boulders, tr. Silt (wet)				
15	12.0'	15	28	14	9
51	Brn. M.F. + Sand, trace mica, tr. silt	13	13	28	10
29	(wet) Running sand from 11.8'				
58	Pcs. of Boulders in Samp. #9	13	15	13	11
106	19.0'				
20	179	26	59	22	12
153	Brn. C.M.F. + Sand, Little C.-M.F. Gravel,				
63	Little Silt, pcs. of Boulders (wet)				
83	22.5'	Drilled			13
93	Core drilled through boulders	Boulders			
25	135				
267					
285	Rec. 19" in Samp. Jar #13				
326	27.8'	30	131	77	14
204	Gray-brn. C.M.F. Sand, Little C.M.F.				
288	Gravel, Little Silt, some decomposed				
314	boulders (wet)				
366	32.0'	29	49	112	15
	Decomposed boulders (dry)				
	33.5'				
35	Core Drilled through boulders				
	36.0'	Core			
		Drilled			
	Gray med. -soft mica-schist				
40	Rec. 2.3'				
	41.5'				

DRILLING TIME  
15 Min./Ft.  
20 " "  
8 " "  
10 " "  
5 " "  
5 " "

End of Boring 41.5'

# BORING B-2

Ground Water Elev. = 451.0 Ground Elev. = 449.98 Bottom of Culvert Slab Elev. = 447.74	Depth	Casing Blows / Ft.	Classification of Material	Blows on Sampler			Sample No.
				0'-6"	6'-12"	12'-18"	
		25	Brn. C.M.F. Sand, Little C.M.F.				
		57	Gravel, pcs. of boulders, tr. silt	11	30	24	1
		62	(wet)	24	30	25	2
		47	3.5'				
	5	58	Brn. C.-M.F. + Sand, some silt, pcs.	19	23	28	3
		48	of Boulders (wet)				
		102	Brn. C.M.F. Sand, some silt, little				
		156	C.-M.F. + Gravel, pcs. of boulders				
		164	(wet)				
	10	297	10.0'	21	16	28	4
		74					
		91	Brn. C.M.+F. Sand, Little M.-F.				
		99	Gravel, tr. silt (wet)				
		83					
	15	84		10	17	17	5
		37					
		64					
		90					
		111	19.3'				
	20	107		6	17	34	6
		48	Brn. C.M.F. + Sand, tr. M.F. Gravel				
		114	pcs. of boulders (wet)				
		240					
		457	23.5'				

135 OE.  
1' Penetr.

End of Boring 23.5'

Note: Bent casing at 23.5'

BORING B-3

Ground Water Elev. = 450.7		Depth	Casing Blows / Ft.	Classification of Material	Blows on Sampler			Sample No.
Ground Elev. = 449.63 Bottom of Culvert Slab Elev. = 447.56					0-6"	6-12"	12-18"	
5	106	Brn. C.M.F. + Sand, Little silt, Little -C.M.F. Gravel, pcs. of boulders 3.5'				1		
	93							
	45		28	47	43			
	95							
	107							
10	294	Brn. C.M.F. Sand, Some -C.M.F. Gravel, Little silt, pcs. of boulders (wet) 7.0'	48	58	60	2		
	94							
	287							
	293							
	191							
15	132	Brn. C.M.F. + Sand, Little -C.M. Gravel, pcs. of boulders (wet) 15.0'	25	44	25	3		
	79							
	120							
	180							
	212		42	58	25			
20	83	Brn. C.M.F. + Sand, some silt, pcs. of boulders (wet) 22.0'				4		
	214							
	115							
	95							
	326		139	115	74			
25	250	Core drilled through boulders Rec. 26" in sample jar #6 27.0'				5		
	297							
			Core					
			Drilled					

End of Boring 27.0'

**Note: Artesian condition at 27.0'**

# BORING B-4

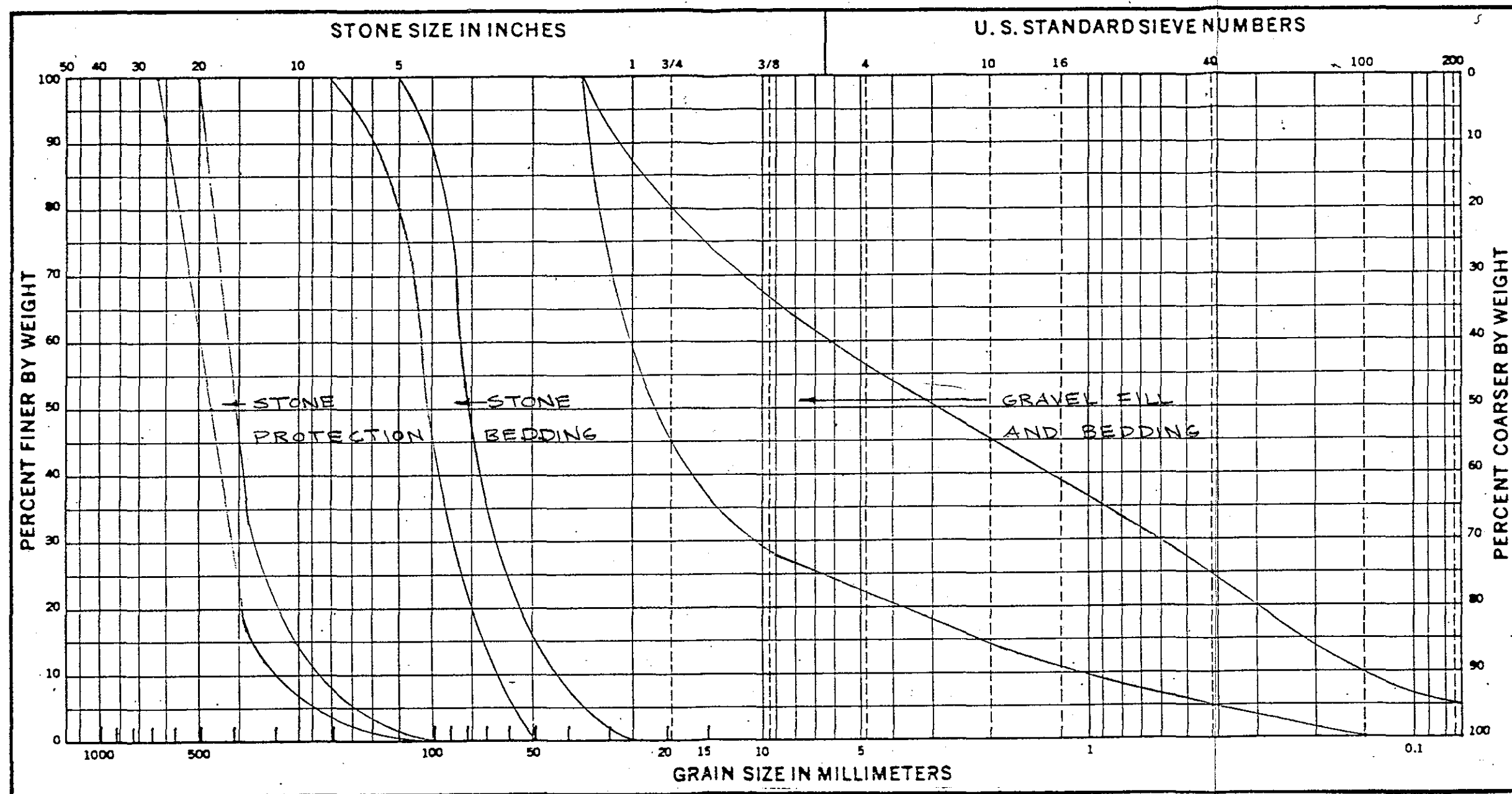
Ground Elev. = 459.63	Depth	Casing Blows / Ft.	Classification of Material	Blows on Sampler			Sample No.	
				0'-6"	6'-12"	12'-18"		
Ground Water Elev. = 450.7	5	35	Gray-brn. C.M.F. + Sand and Silt, Little C.M.F. Gravel Pcs. of boulders (wet)				1	
		29						
		19						
		27						
		33						
	10	23						
		25						
		73						
		48						
		51			24	28		49
Bottom of Culvert Slab Elev. = 447.72	38							
	163							
	172		13.0'					
	103							
	66							
15	25	Brn. C.M.F. + Sand, and -Silt decomposed boulders and gravel (wet)		20	29	37	2	
	58							
	81							
	63							
	18.3'							
20		Core drilled through soil and boulders from 18.3' to 26.0' recovery in sample jar #3	Core			3		
			Drilled					
			Boulders					
25				26.0'				
30		Brn. C.M.F. + Sand, Little Silt, Little -M.F. Gravel (damp)	76"			4		
			38"					
			104"					
			54"					
			32"					
			37"					
			41"					
			134"					
			164" = 0.5'					
		Refusal at 34.5'	34.5'					

Note: At the inspector's request  
we drove an O.E. sampler  
from 26.0' to 34.5'.  
Recovery is in sample  
jar #4

Lost drilling water at 20.3'

\* Blows on sampler for 12"





## GRADATIONS

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION  
CORPS OF ENGINEERS  
WALTHAM, MASS.

DES. BY PS

DR. BY PS

CK. BY

PROPOSED GRADATIONS

SECTION 205 STUDY

WATERBURY, CT

GEOTECH. ENG. BR.

SCALE: —

PL. NO. 2-4

DATE: 27 DEC. 85

**SECTION 4**  
**REAL ESTATE**

# TABLE OF CONTENTS

ITEM	PAGE NO.
PURPOSE	1
INSPECTION OF THE REAL ESTATE	1
LOCATION	1
BASIN DESCRIPTION	1
PROJECT DESCRIPTION	1
CHANNEL IMPROVEMENTS	2
ENVIRONMENT SETTING	2
TOPOGRAPH FEATURES	2
ZONING	2
GOVERNMENT OWNED FACILITIES	3
RIGHTS TO BE ACQUIRED	3
FEE AND EASEMENT AREAS (PERMANENT & TEMPORARY)	3 & 4
ACQUISITION COSTS	4 & 5
RELOCATION COSTS	5 & 6
SEVERANCE DAMAGES	6
PROTECTION AND ENHANCEMENT OF CULTURAL ENVIRONMENT	6
CONTINGENCIES	6
EVALUATION AND CONCLUSION	7
SUMMARY OF REAL ESTATE COSTS	7
ADDENDA	
COMPARABLE SALES CHART	8

## PURPOSE

The purpose of this report is to estimate the preliminary real estate costs associated with the upper Mad River, Woodtick area Local Flood Protection Project in Waterbury, Connecticut.

## INSPECTION OF THE REAL ESTATE

The properties affected by the proposed project were viewed in the field during February 1986.

## LOCATION

The city of Waterbury is located in west-central Connecticut, about 20 miles north of New Haven, Connecticut and about 25 miles southwest of Hartford, Connecticut. The study area is located about 3 miles upstream from the mouth of the Mad River between Sharon and Frost Road Bridges. This section of Waterbury is referred to as the Woodtick area and consists primarily of residential development, including several apartment and condominium complexes. There are also some light manufacturing companies and a large retail shopping mall in this area. Waterbury is one of the thirteen communities that make up the Central Naugatuck Valley Region (CNVR).

## BASIN DESCRIPTION

The Mad River originates at Cedar Swamp Pond in Wolcott, Connecticut and flows in an erratic southwesterly course for about 11 miles to its confluence with the Naugatuck River in Waterbury. The Mad River has a total drainage area of 26.4 square miles and a total fall of about 640 feet. The basin is quite steep and the lower portion is heavily urbanized.

## PROJECT DESCRIPTION

The plan consists of channel widening along two areas of the Mad River, totaling 1,270 linear feet. These areas are located in the vicinity of Frost Road Bridge and near Bouffard Avenue.

Channel work can be accomplished with land tracked equipment from the stream bank. Traversing of the riverbed with equipment would be kept to a minimum. A temporary cofferdam would be placed along the channel in areas of retaining wall construction to divert stream flows away from the work area.

## CHANNEL IMPROVEMENTS

The proposed channel improvements would have a 50-foot bottom width, and would tranverse a distance of 850 feet with 2 horizontal on 1 vertical side slopes. A 2-foot layer of stone protection resting on a 1-foot layer of gravel bedding would be placed around the abutments of Frost Road Bridge and along exposed areas of the riverbank to prevent erosion. Utility crossings and storm drain outlets in the work areas would also be protected with stone protection. Approximately 420 linear feet of concrete retaining walls, varying in height from 8-14 feet, would be constructed along the riverbank in two areas where there is insufficient space for stone slope protection. These areas are on the downstream side of Frost Road Bridge and near Bouffard Avenue.

## ENVIRONMENTAL SETTING

The Woodtick area consists primarily of residential development, including several apartment and condominium complexes. There are also some light manufacturing companies and a large retail shopping mall in this reach.

## TOPOGRAPHIC FEATURES

The study area is located about 2.5 miles east of downtown Waterbury in the New England upland section of the New England physiographic province. The topography is generally characterized by broad valleys and smooth hills.

At the upstream end of the project area the river flows through a plain which has elevations of about 460 to 470 feet NGVD and is about 1 mile wide. The surrounding hills are about 600 to over 800 feet NGVD in elevation. Near Frost Road Bridge the river valley becomes constricted. The channel is confined between the 400-foot NGVD contours which are less than 50 feet wide in places.

## ZONING

The zoning regulations presently in effect for the proposed flood control project are as follows:

RESIDENTIAL-SINGLE (RL) minimum 4,500 square feet of land with 60 foot frontage, 20 feet set back, 15 feet side yard and 25 feet rear yard.

RESIDENTIAL-MULTI-FAMILY (RM) minimum 6,000 square feet of land, 75 foot frontage, 25 feet set back, 16 feet side yard and 25 feet rear yard.

NEDRE-A

COMMERCIAL (CA) minimum 10,000 sf of land with 100 foot frontage, 50 feet set back, 15 feet side yard and 25 feet rear yard.

#### GOVERNMENT-OWNED FACILITIES

Section III of the Act of Congress approved 8 July 1958, (PL 85-500) authorized the protection, realteration, reconstruction, relocation or replacement of municipally-owned facilities. A preliminary inspection of the property area indicated no Government-owned facilities are affected.

#### RIGHTS TO BE ACQUIRED

Local interests will be required to provide all lands and easements necessary for project purposes.

#### EE EASEMENT AREAS

##### Ee Areas

None required.

##### Permanent Easement Areas

Permanent easements for construction and maintenance purposes is necessary. The easement area varies in width and is approximately 50 feet in width throughout the project area and contains about 1.38± acres of private lands. Alignment of portions of the river will affect sixteen (16) private ownerships.

Preliminary investigations indicate that after the imposition of the permanent easement interest, the highest and best use of the remainders of the properties affected will not be materially affected. However, it is historically known that the mere knowledge and existence of the imposition infers a restrictive aspect. Therefore, the cost to acquire the permanent easement interest would be equivalent to the underlying fee value since those uses would be for project purposes. However, lands would remain in their private ownerships to maintain conformity of their existing lot areas. The estimated costs for the easement rights are predicated on the assumption that construction methods will be of the excavation and placement methods and would not adversely affect surface or near-surface improvements. If it is determined and found that selected methods of construction would cause damage to surface or near-surface improvements, then the estimated costs for easement rights would not remain valid and a new in-depth real estate study of the proposed taking would be required.

The following costs for the permanent easement interests are predicated on an estimated market value of \$1.41 per square foot in the commercial area and \$2.00 per square foot in the residential areas.

#### COMMERCIAL

Three (3) Commercial Private Ownerships (21,280 SF of Land @ \$1.41 PSF)	\$30,004.80
---	-------------

#### RESIDENTIAL

Thirteen (13) Residential Private Ownerships (39,042 SF of Land @ \$2.00 PSF)	\$78,084.00
TOTAL	\$108,088.80
CALL	\$108,100.00

#### Temporary Construction Easements

Temporary construction easements required to complete the channel enlargement contain about 1.39± acres.

Approximately one acre of land will be required for a staging area and is available in the immediate vicinity. Additional Temporary Construction Easements of .39± acres, which is approximately 40 feet in width along each side of the channel is required, for the project.

All of the 1.39± acres are privately owned.

The land areas to be encumbered by temporary easements have an estimated market value of about \$1.41 per square foot in the commercial area and approximately \$2.00 per square foot in the residential area. The following estimates are predicated upon a fair return of invested capital. The use of the owner's land for a one year term is as follows:

#### STAGING AREA

43,560 SF Private Commercial Land of (3) Ownerships @ \$1.41 per square foot	\$61,419.60
--	-------------

#### TEMPORARY EASEMENT AREA

17,200 SF Private Residential Land of (13) Ownerships @ \$2.00 per square foot	\$34,400.00
TOTAL	\$95,819.60
	x15%

Fair Return @ 15% per year (for one year term)	\$14,372.94
CALL	\$14,400.00

## ACQUISITION COSTS

Acquisition costs will include costs for mapping, surveying, legal descriptions, title evidence, appraisals, negotiations, closing and administrative costs for possible condemnations. The acquisition costs are based upon this office's experience in similar civil works projects in the general area and are estimated at \$3,000.00 per ownership. Approximately sixteen (16) total ownerships will be affected by the proposed project.

ACQUISITION COSTS (16 OWNERSHIPS)	\$48,000.00
-----------------------------------	-------------

## RELOCATION COSTS

Public Law 91-646, Uniform Relocations Assistance Act of 1970, provided for uniform and equitable treatment of persons displaced from their homes, businesses, or farms by a Federally Assisted Program. It also established uniform and equitable land acquisitions policies for these projects. Included among the items under PL 91-646 are the following:

- a. Moving Expenses
- b. Relocation Allowance (Business)
- c. Replacement Housing (Tenants)
- d. Relocation Advisory Services
- e. Recording Fees
- f. Transfer Taxes
- g. Mortgage Prepayment Costs
- h. Real Estate Tax Refunds (Pro-Rata)

Preliminary investigations indicate that none of the sixteen ownerships will require relocation. Should the existing preliminary taking lines be changed to include improvements then the taking authority must certify that there will be available, in areas generally not less desirable and at rents/prices within the financial means of the tenants that would be displaced, decent and safe sanitary facilities, equal in number to the number of, and available to, such displaced persons who require such dwellings and reasonably accessible to their places of employment.

There are sixteen ownerships affected by the permanent easement interests. Therefore, the following estimates are included for planning purposes and are limited to expenses incidental to the transfer of real estate interests.



RELOCATION ASSISTANCE COSTS	
(13 Residential Ownerships @ \$200)	\$2,600.00
RELOCATION ASSISTANCE COSTS	
(3 Commercial Ownerships @ \$200)	\$ 600.00
TOTAL RELOCATION ASSISTANCE COST	\$3,200.00

#### SEVERANCE DAMAGES

Severance damages usually occur when partial takings are acquired which restrict the remaining portion from full economic development. The severance damages are measured and estimated on the basis of a "Before" and "After" appraisal method and will reflect actual value loss incurred to the remainder as a result of partial acquisition. Detailed appraisals will reflect these losses.

Preliminary investigations indicate that none of the sixteen (16) ownerships will incur severance damage due to the proposed takings. The thirteen (13) residential ownerships and three (3) commercial ownerships will remain conforming to existing residential and commercial zone requirements. Estimated severance damages to the subject parcel is as follows:

ESTIMATE OF SEVERANCE DAMAGE	\$ -0-
------------------------------	--------

#### PROTECTION AND ENHANCEMENT OF CULTURAL ENVIRONMENT

In accordance with instruction set forth in teletype DA (DAEN) R 191306A, dated October 1971. Subject: "E011593, 13 May 1971. Protection and Enhancement of Cultural Environment"; a study has been made in the subject areas. The study revealed that no local, State, Federally owned nor Federally controlled property of historical significance would fall within the provisions of E011593.

#### CONTINGENCIES

A contingency allowance of 25 percent is considered to be reasonably adequate to provide for possible appreciation of property values from the time of this estimate to the acquisition date, for possible minor property line adjustments or for additional hidden ownerships which may be developed by refinement to taking lines, for adverse condemnation awards and to allow for practical and realistic negotiations.

NEDRE-A

## EVALUATION AND CONCLUSION

A careful and thorough search of the City of Waterbury's records was made to obtain sales data. Those sales considered to be similar in nature and character to the properties which will be affected by the proposed project are listed in the addenda of this report. Considerable effort was made to interview either grantor or grantee to establish the authenticity of each transaction. The sales were inspected in the field. Real Estate appraisers, broker's and knowledgeable officials of the City of Waterbury were interviewed to obtain sales data used in arriving at values for this project.

## SUMMARY OF REAL ESTATE COSTS

The following is an estimate of the real estate costs for the interests being proposed for The Woodtick Mad River Flood Control Project.

### LAND & IMPROVEMENTS

ROUNDED TO CLOSEST \$100

Fee Acquisition	-0-
Permanent Easements	\$108,100.00
Temporary Easements	\$ 14,400.00
TOTAL	\$122,500.00

Contingency - 25% of Above	\$ 30,625.00
----------------------------	--------------

Sub Total	\$153,125.00
Acquisition Costs	\$ 48,000.00
Relocation Assistance Costs	\$ 3,200.00
Severance Damages	-----0-----

Total Estimated Real Estate Costs	\$204,325.00
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CALL	\$204,400.00
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TABLE A-10N DE SUPPORTING SALES DATA  
LAND SALES - WATERBURY AREA

SALES NO.	GRANTOR	GRANTEE	DATE	AREA	SALES PRICE	UNIT VALUE	ZONING
1	PIETRA	VICIRA	5/85	11,500sf	\$22,000	\$1.91sf	R
2	YORK	ERICKSON	11/85	12,560sf	\$24,900	\$1.99sf	R
3	O'KEEFE	VITALE	12/85	12,700sf	\$25,000	\$1.97sf	R
4	DONAHUE	HARNEY	1/86	15,000sf	\$29,900	\$1.99sf	R
5	CERRITELLI	YOUNG	9/85	45,000sf (1.03± ac)	\$63,000	\$1.40sf	C
6	VALLEY MANOR ASSOCIATES	GHENT	7/85	68,000sf (1.56± ac)	\$95,900	\$1.41sf	C
7	C & C REALTY TRUST	MOREY	10/85	86,880sf (2.0± ac)	\$122,500	\$1.41sf	C

**SECTION 5**  
**PUBLIC INVOLVEMENT**

## TABLE OF CONTENTS

<u>ITEMS</u>	<u>PAGE No.</u>
OBJECTIVES	A-1
PUBLIC INVOLVEMENT	A-1
FUTURE PUBLIC INVOLVEMENT	A-2
PERTINENT CORRESPONDENCE	A-2

## **OBJECTIVE**

In the broadest sense, the "public" consists of non-Corps of Engineers entities, Federal State, local and regional agencies as well as public and private organizations and individual citizens. The public participation program is intended to provide a continuous two-way communication process which will maximize the opportunity for the public to (1) be involved in the overall planning process; (2) be aware of the study progress; and (3) make decisions that would have impacts on the lives of those in the study area. Inasmuch as major decisions made throughout the study will be based upon expressed needs of local, county, State and regional officials as well as the general public, it is necessary to establish a mechanism to channel information to interested participants and to funnel their responses to those conducting the study.

## **PUBLIC INVOLVEMENT**

Following the severe flooding that occurred in June 1982, the former Mayor of Waterbury, Edward D. Bergin, requested the Corps to investigate flooding conditions along the Mad River, in the Woodtick section of Waterbury, and develop a plan to reduce the risk of future flood losses. Our initial study was completed in 1984 and concluded that Federal participation in the construction of channel modifications along the Mad River was economically justified.

Coordination has been maintained throughout the study with the U.S. Fish and Wildlife Service and the Connecticut Department of Environmental Protection. Through this coordination potential impacts to fish and wildlife habitat were identified. This coordination has resulted in several letters from these agencies recommending various measures that would help reduce the adverse impacts of the proposed project. Many of these measures have been incorporated into the project. Final coordination letters were received from these agencies during the 60-day public review period (see Pertinent Correspondence).

During June 1986, over 50 draft copies of this report were distributed to other Federal, State and local agencies for public review. This gave all interested parties the opportunity to comment on the finding of our study. During the public review period we received several letters to support along with several others that raised questions and concerns about the findings of our study. These letters, along with our responses are contained in Appendix A.

## **FUTURE PUBLIC INVOLVEMENT**

This report has been finalized and forwarded to the Office of the Chief of Engineers in Washington for review and approval to begin preparation of plans and specifications. Public coordination will be maintained during all future study efforts.

## **PERTINENT CORRESPONDENCE**

<b><u>AGENCY</u></b>	<b><u>DATE</u></b>
STATE OF CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION	31 AUG 1987
HONORABLE JOSEPH SANTOPRETRO MAYOR OF WATERBURY	4 DEC 1986
U.S. FISH AND WILDLIFE SERVICE (Corps response dated 3 OCT 1986)	21 AUG 1986
STATE OF CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION (Corps response dated 22 OCT 1986)	20 AUG 1986
NATIONAL MARINE FISHERIES SERVICE	19 AUG 1986
HONORABLE JOHN G. ROWLAND U.S. HOUSE OF REPRESENTATIVES (Corps response dated 10 SEP 1986)	18 AUG 1986
U.S. ENVIRONMENTAL PROTECTION AGENCY (Corps response dated 3 OCT 1986)	7 AUG 1986
ANTHONY MASCIA WATERBURY, CONNECTICUT (Corps response dated 23 SEP 1986)	1 AUG 1986
PAUL ROBITAILLE ROYAL CREST ESTATES WATERBURY, CONNECTICUT	1 AUG 1986

## **PERTINENT CORRESPONDENCE**

(cont'd)

### **AGENCY**

### **DATE**

HISTORIC PRESERVATION OFFICER FOR CONNECTICUT

9 JUL 1986

MARIO AURELI

7 JUL 1986

WATERBURY, CONNECTICUT

(Corps response dated 26 AUG 1986)

STATE HISTORIC PRESERVATION OFFICER FOR  
CONNECTICUT

22 NOV 1986

U.S. FISH & WILDLIFE SERVICE

15 NOV 1986

HONORABLE EDWARD BERGIN

20 OCT 1983

MAYOR OF WATERBURY

HONORABLE CHRISTOPHER J. DODD

1 JUN 1983

UNITED STATES SENATOR

(Corps response dated 9 JUN 1983)





STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



August 31, 1987

Thomas A. Rhen  
Colonel, Corps of Engineers  
Division Engineer  
424 Trapelo Road  
Waltham, MA 02254-9159

Dear Colonel Rhen:

The Department of Environmental Protection has reviewed the Detailed Project Report and the Draft Local Cooperation Agreement prepared for the proposed channel modifications along the Mad River in the woodtick area of Waterbury.

In previous correspondence to your office the Department has supported providing flood protection to this area and in subsequent discussions and meetings with your staff, agreed to a revised typical channel cross-section. Utilizing this revised cross-section will maintain the hydraulic flow characteristics of the river during low flow conditions, thus maintaining the sediment transport capability and minimum water depth for fish passage. It is further noted that your letter of October 22, 1986 concurred with our review comments and that low flows would be directed only through the middle of the three box culverts at the bridge and planting of high value shrubs and trees will be placed along the stretches of the river affected by the project.

As preliminary designs are developed we would request an opportunity for further review. It should also be noted that additional data will be necessary to initiate the permit processes.

The Department has also reviewed the Draft Local Cooperative Agreement and as the State will formally be the sponsor of this project, we agree in concept with the document. The Department of Environmental Protection intends to meet all the items of local cooperation, and it will be our intent to initiate a parallel agreement between the City of Waterbury and the State of Connecticut transferring most of the items of local cooperation to the City. As further discussions are undertaken on this issue we will keep your staff informed.

Phone:

165 Capitol Avenue • Hartford, Connecticut 06106

*An Equal Opportunity Employer*

I would hope that this letter clearly provides the State's support for providing flood protection for the Woodtick section of Waterbury. I would like to take this opportunity to thank you for the Corps of Engineers efforts in providing flood protection assistance to the State of Connecticut and I am looking forward to working with you in the future.

If you have any questions or need additional information, please do not hesitate to contact either my office or Benjamin A. Warner, Director of the Department's Water Resources Unit.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Leslie Carothers".

Leslie Carothers  
Commissioner

LC:CEB:aek

JOSEPH J. SANTOPIETRO  
MAYOR



236 GRAND STREET  
WATERBURY, CONNECTICUT 06702

December 4, 1986

Mr. Thomas A. Rhen  
Colonel, Corps of Engineers  
Division Engineer  
424 Trapelo Road  
Waltham, Massachusetts 02254-9159

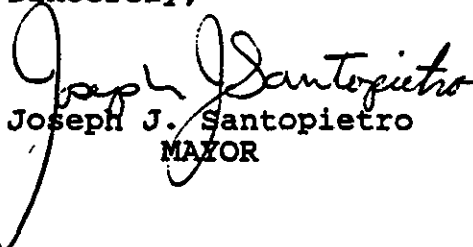
Dear Mr. Rhen,

The City of Waterbury, Connecticut supports the proposed local flood protection project along the Mad River in the Woodtick Area of Waterbury as outlined in the draft Detailed Project Report (DPR) dated October 1986.

The City of Waterbury also fully understands and intends to satisfy the items non-Federal responsibility as indicated in the draft Local Cooperation Agreement (LCA) included in the DPR. The proposed project will significantly reduce the risk and severity of future flood losses along the Mad River.

We understand that execution of a formal LCA will be required after the Plan and Specifications are substantially complete. At that time, a more detailed estimate of project costs and appropriate cost sharing arrangements will be prepared. The City of Waterbury will consider a formal agreement at that time.

Sincerely,

  
Joseph J. Santopietro  
MAYOR

JJS/dg



# United States Department of the Interior

FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES

P.O. BOX 1518

CONCORD, NEW HAMPSHIRE 03301

Colonel Thomas A. Rhen  
Division Engineer  
New England Division  
U.S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254

AUG 21 1986

Dear Colonel Rhen:

This letter constitutes our response to the Draft Detailed Project Report (DDPR) and Environmental Assessment for the Mad River - Woodtick Flood Control Project in Waterbury, Connecticut. It has been prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and constitutes our Fish and Wildlife Report on the project.

The proposed project is designed to provide 100-year flood protection to residential and commercial buildings in the Mad River Basin in Waterbury, Connecticut. Flooding during the spring of 1983 caused flood damage to residential property on the Mad River and along Woodtick Road, Lund, Bouffard, and Glenbrook Avenues. Much of the flooding problem is a direct result of development in the floodplain. To address this problem, your proposed plan involves widening the channel along two areas of the Mad River. It is unclear whether channel widening along two areas of the Mad River would be 1270 linear feet or 900 linear feet, both figures are in the DDPR. This should be clarified in your final report. Channel work would be conducted near Frost Road Bridge and near Bouffard Avenue where the accumulation of silt and debris has restricted flood flows. The channel would be widened to 50 feet with 1 vertical to 2 horizontal side slopes. Rock riprap and a concrete double wall would be placed around the abutments of Frost Road Bridge and along the riverbank to prevent erosion. In the vicinity of Bouffard Avenue, rock riprap and a concrete wall would be installed to protect private residences.

Our planning aid letter of November 15, 1984 advised your office of the Fish and Wildlife Service's concerns regarding this project. The Mad River in the Woodtick area retains significant fish and wildlife resource values despite a history of extensive urban development, namely residential and commercial properties in the floodplain. Development in the floodplain subjects property owners to flooding and also reduces the floodplain's ability to absorb and properly channel flood waters. Floodplain development persists today, particularly across the river from Royal Crest Estates. Riparian vegetation from Frost Road to the Naugatuck Valley Mall parking lot consists of a narrow, dense band of trees, shrubs, forbs and grasses. The more common species in this riparian zone includes red maple, gray birch, cottonwood, willow, red oak, speckled alder, crab apple, silky dogwood and smooth sumac. A pair of red-tailed hawks were seen perched in a cottonwood above the river during our field review of the project site on July 30, 1986. It is conceivable that

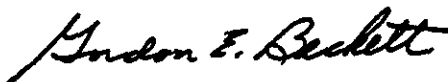
this resident pair of birds has a well hidden nest in the dense foliage of a nearby tree although no nest site was discovered. A more thorough search of the riparian zone for raptor nests in late fall after the leaves have dropped may be more productive than summer surveys. Yellow warblers, chestnut-sided warblers, yellow-throats, chats, mockingbirds, song sparrows, cardinals, grackles, American goldfinches, bluejays, and hummingbirds were also observed during the July field review. The riparian zone is sparse and broken from the Naugatuck Valley Mall parking lot to Sharon Road. Nonetheless, numerous songbirds were seen in this narrow band of cover.

The water quality of the Mad River in the Woodtick area is class B water according to the State of Connecticut. It is relatively clear, clean and well oxygenated. River substrate consists primarily of gravel-cobble, excellent habitat for caddis fly larva, crayfish and other invertebrates which are preyed upon by a small population of wild brook trout and stocked brown trout. Silt deposits present throughout much of the watershed are due to runoff from disturbed sites along the watershed, particularly in the vicinity of the Royal Crest Estates. Although this class B water has been degraded by silt deposits, it still supports trout in addition to white sucker, blacknose dace and minnows.

In accordance with the U.S. Fish and Wildlife Service Mitigation Policy, we consider this to be resource category 3 habitat (FR Vol. 46, No. 15, January 23, 1981) because of its value to resident salmonids and migratory songbirds. Widening and deepening this stretch of the Mad River from Frost to Sharon Road would destroy riparian habitat valuable to a variety of wildlife. Stream channelization would degrade or destroy habitat supporting a small resident wild brook trout population. Channelization appears to be inconsistent with Executive Order No. 11988 regarding floodplain protection and the 404(b)(1) Guidelines. Destroying portions of the riparian zone and river bottom as proposed in the draft detailed project report is not an environmentally acceptable way of achieving flood protection in Waterbury, Connecticut. We believe the DDPR should address other less environmentally damaging alternatives, such as a 10, 30, or 50 year flood protection plan. We are available to comment on alternatives to a 100-year flood protection plan. Additionally, your final report should recommend a mitigation plan to compensate for unavoidable losses of your selected alternative. Our goal is to have no net loss of habitat values, while minimizing losses of in-kind habitat values.

Ron Joseph of my staff is available to continue our coordination for this project. Please let us know if we can be of further assistance.

Sincerely yours,



Gordon E. Beckett  
Supervisor  
New England Area

CC: RO/HR Reading File  
REO  
EPA, Municipal Permits  
Conn. DEP  
R. Orciari, CT DEP, Pleasant Valley  
CE, Joe Horowitz  
ES: RJoseph:jd:8-19-86:834-4411

October 3, 1986

Planning Division  
Plan Formulation Branch

Mr. Gordon E. Beckett, Supervisor  
U.S. Dept. of the Interior  
Fish and Wildlife Service  
Ecological Services  
P.O. Box 1518  
Concord, New Hampshire 03301

Dear Mr. Beckett:

This is in response to your comments of August 21, 1986, concerning the proposed draft Detailed Project Report (DPR) plan to reduce flood damages along the Mad River in the Woodtick section of Waterbury, Connecticut.

The first request in your letter was to confirm the amount of localized channel widening proposed in the DPR. Approximately 1,270 linear feet of channel widening is currently planned in two sections upstream and downstream of the Frost Road Bridge.

The findings in the DPR have determined that the proposed project is consistent with both Executive Order No. 11988 regarding flood plain development and Section 404(b)(1) guidelines. In coordination with the city of Waterbury and the upstream community of Wolcott, we have learned that future development in the floodplain is not likely and, therefore, should not be an issue as a secondary effect of the proposed project. The city of Waterbury has almost reached a saturation level in land development, while the town of Wolcott would limit future development through strict land use controls. In addition, the infrastructure at this time in Wolcott is fully developed. The project is consistent with Section 404(b)(1) guidelines because there were no practicable alternatives to the proposed project, and the adverse impacts to the aquatic environment are not considered significant and/or have been offset by the following design measures:

- (a) low flow channel for continued fish passage;
- (b) placement of instream boulders for instream cover; and
- (c) planting of trees/shrubs of high wildlife value on the riverbank.

I can appreciate your agency's concerns and can assure you that all practical flood damage reduction alternatives have been examined. The localized channel widening was found to be the only alternative that would reduce flood damages while minimizing adverse environmental impacts. This also takes into consideration the fact that more substantial channel

modifications were accomplished a few years ago when the Royal Crest Apartments were constructed. I hope that this letter answers your concerns. If you have any further questions, contact me at (617) 647-8508. Mr. Robert Russo is the Project Manager for this study and can be reached at (617) 647-8547.

Sincerely,

Joseph L. Ignazio  
Chief, Planning Division

Enclosure

cc:  
Mr. Jackson  
Reading File  
Plan Div Files





STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



August 20, 1986

Joseph L. Ignazio  
Chief, Planning Division  
Department of the Army  
Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254-9149

Dear Mr. Ignazio,

The Department of Environmental Protection has reviewed the Draft Project Report/Environmental Assessment for the local flood protection project in the Woodtick area of Waterbury. In general, we can support a Federal project in this area to alleviate existing flooding problems. We do, however, suggest that the design be slightly altered to achieve greater mitigation of potential fisheries and water quality impacts.

The typical widening section depicted on plate 5 of the report shows a low flow channel which is 30 feet wide. During low flow periods, this will result in a very shallow and broad stream, a negative impact on fishery habitat and water quality. We suggest that alternative designs be considered to lessen these potential impacts.

A much narrower channel should be created to convey the low flows experienced during late summer. The depth of water can vary along this channel (in fact, that would be preferable), but should be at least 6-8 inches and up to 1.5-2 feet during the low flow periods.

We also suggest the use of plantings to provide shade to the low flow channel. This would lessen the increase of water temperature caused by clearing existing vegetation along the stretches of the river affected by the project and result in benefits to water quality and habitat values. The attached cross section of a plan for another channelization project in Connecticut provides a conceptual view of this design proposal.

Understandably, such a configuration would affect the hydraulics of the flood channel and result in higher yearly maintenance costs to clear debris, but we believe that such efforts are justified. Public expenditures, federal, state and local, to improve water quality in the Naugatuck River valley have been considerable. This commitment should not be jeopardized by other projects supported by public funding which would tend to degrade water quality.

Phone:

165 Capitol Avenue • Hartford, Connecticut 06106

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Joseph L. Ignazio

-2-

August 20, 1986

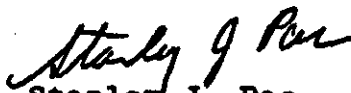
We also suggest that low flows be directed through only the middle of the three box culverts at the Frost Road bridge. This can be achieved by placing a lip at the upstream openings of the other two culverts. This will facilitate fish passage and not significantly affect the hydraulic capacity of the culverts.

In several places in the report, it is stated that development in the watershed upstream of the project area is expected to be slow and restricted by the lack of infrastructure. However, we are aware of a proposal by the Town of Wolcott for a 180 acre industrial park along Old Tannery Brook and an unnamed tributary of the Mad River. This project and the extension of sewer and water lines to the area which it would require could result in substantial development in the upstream watershed. This factor should be considered in calculating the hydraulic capacity of the proposed channelization.

The expenditures for real estate detailed in the report are confusing. In Appendix 4, a total cost for permanent and temporary easements is calculated at \$204,400, yet Table 6 lists real estate costs as \$50,000. In addition, our Land Acquisition and Management Unit has performed a preliminary study of potential costs and estimates a total of \$375,000. The memo from Jerry Knight which itemizes this estimate is enclosed.

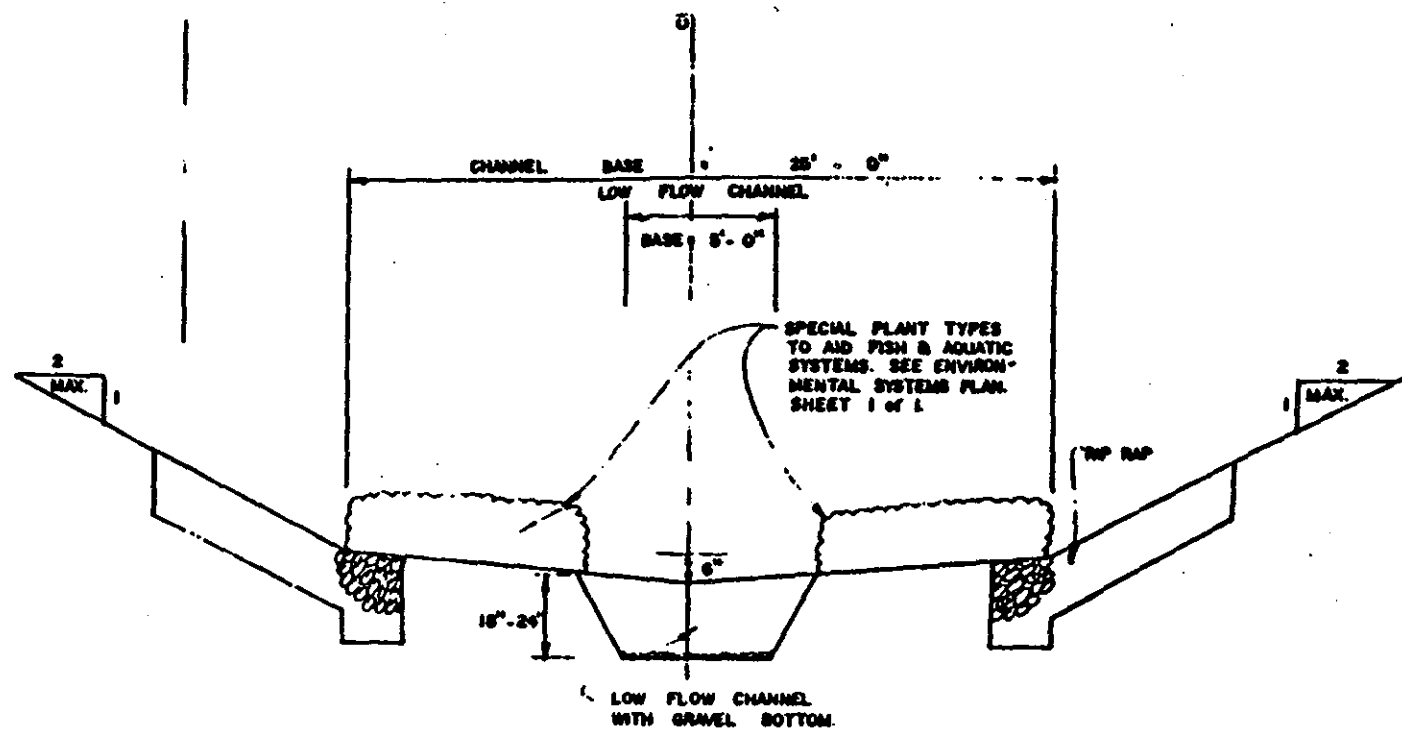
Thank you for the opportunity to review this proposed project. I trust that our suggestions will be carefully considered so that this project can be completed in the most environmentally acceptable manner. If you have any questions concerning these comments, please contact Brian Emerick or Dave Fox of my planning staff at 203-566-3740. Thank you.

Sincerely,

  
Stanley J. Pac  
Commissioner

Attachments

cc: Horace Brown/OPM



#### NOTES:

##### 1. PLANTING TYPES TO BE USED:

- A. SPICEBUSH, WILD ALLSPICE  
"Lindera benzoin"
- B. SPECKLED ALDER  
"Alnus rugosa"
- C. SUMMERSWEET, SWEET PEPPERBUSH  
"Clethra alnifolia"
- D. Highbush Blueberry  
"Vaccinium corymbosum"
- E. SHRUB WILLOW  
"Salix spp."

CONTRACTOR SHALL FOLLOW THE PLANTING INSTRUCTIONS GIVEN BY THE PLANT SUPPLIER.

#### TYP. CHANNEL SECTION

SCALE: 1" = 5'

IV. 4/83  
6938-037-01)

Obtain "STATE EMPLOYEE SUGGESTION" forms from, and send your ideas to: Employee's Suggestion Awards Program, 165 Capitol Avenue Hartford, Ct, 06106.

To	NAME, TITLE Jerry F. Knight, SRA Supervising Appraiser	DATE 8-7-86
	AGENCY, ADDRESS DEP- Land Acquisition & Management, Rm. 102, State Office Bldg., Hartford, CT	
From	NAME, TITLE Ronald W. Chernovetz, Appraiser <i>R. Chernovetz</i>	TELEPHONE 566-2904
	AGENCY, ADDRESS DEP-Land Acquisition & Management, Rm. 102, State Office Bldg., Hartford, CT	

Subject: COST ESTIMATE - Mad River Flood Control Project, Waterbury, CT

In accordance with your request, I have made a preliminary study of the above referenced property as of July 23, 1986. This preliminary study consisted of reviewing similar type property transactions within the Mad River/Woodtick section of Waterbury.

It should be clearly understood that an appraisal has not been made of the above referenced property and that this memorandum does not constitute an appraisal report, nor should it in any way be construed as same.

The flood control plan consists of channel widening along two areas of the Mad River, totaling 1270 linear feet. The affected area consists of residential dwellings; apartment and condominium complexes; some light manufacturing companies and the Naugatuck Valley Shopping Mall.

The following zoning regulations govern the affect properties within the proposed flood control project area:

#### LOW DENSITY RESIDENCE

Two family

(R.L.) Minimum 6000 s.f. of land with 60 feet frontage; 20 ft. set back; 25 ft. rear yard and combined side yards of 16 ft.  
(R.L.) Minimum 7500 s.f. of land with 75 ft. frontage; 20 ft. setback; 25 ft rear yard and combined side yards of 16 ft.

#### MODERATE DENSITY RESIDENCE

(R.M.) Minimum 6000 s.f. of land or 1800 s.f. per dwelling unit, whichever is greater; 60 feet of frontage; 15 ft. setback; 25 ft. rear yard and combined side yards of 16 ft.

#### ARTERIAL COMMERCIAL

(C.A.) Minimum 10000 s.f. of land with 100 ft. frontage; 50 ft. setback (1 acre) 15 ft. (Less than 1 acre) 25 ft. rear yard abutting residential area; no side yard requirement

Permanent easements for construction and maintenance will affect 16 owners and contain 1.38  $\pm$  acres of land. This easement area is approximately 50 feet in width throughout the project area.

Temporary construction easements will involve 1.39  $\pm$  acres of privately owned land. Of this, approximately one (1) acre will be needed for a staging area.

Highest and Best Use of the subject properties is for their continued improved residential or commercial use.

Six vacant residential sales in Waterbury were investigated and studied. These late 1985-86 sales ranged in size from 4500 s.f. to 10,800 s.f. and in price from \$1.53 to \$4.70 per square foot. Sales on the westside of Stillson Road ranged in size from 4500 to 5000 s.f. and in price from \$4.66 to \$4.70 per square foot. The eastside sales ranged in size from 8700 to 10,800 s.f. and in price from \$2.12 to \$2.69 per square foot.

Based upon a preliminary evaluation, it is my opinion, in light of the affected parcels smaller size and location, that the residential (R.L. & R.M.) zoned land would have an estimated market value of \$4.50 per square foot.

Five vacant commercial sales were reviewed and analyzed. The three 1984 sales ranged in size from 28,000 to 40,000 s.f. and in price from \$1.83 to \$2.50 per square foot. The 1985-86 sales ranged in size from 5130 to 68,000 s.f. and in price from \$1.26 to 2.54 per square foot. The subject parcels are located in the Naugatuck Valley Mall area which is considered superior due to present build up and high traffic exposure.

Based upon a preliminary evaluation, it is my opinion, in light of superior location that the commercial (CA) zoned land would have an estimated market value of \$2.50 per square foot.

Using the afore-mentioned value estimates for the residential and commercial properties resulted in the following estimates of real estate costs for the interests being proposed for the Woodtick Mad river Flood Control Project as of July 23, 1986.

#### LAND & IMPROVEMENTS

Fee Acquisition	0
Permanent Easements	\$ 229,000
Temporary Easements	28,000
Total	\$ 257,000
Contingency - 25% of Above	\$ 65,000
Sub Total	\$ 322,000
Acquisition Costs	48,000
Relocation Assistance Costs	3,200
Severance Damages	0
Total Estimated Real Estate Costs	\$ 373,200

375,000 (Rounded)

<u>Sales No.</u>	<u>Grantor</u>	<u>Grantee</u>	<u>Date</u>	<u>Area</u>	<u>Sales Price</u>	<u>Unit Value</u>	<u>Zoning</u>
1	Seutts	Sinclair	10-85	7,200 s.f.	\$11,000	\$1.53	R
2	Yannelli	Stigliani	10-85	8,700 s.f.	\$18,500	\$2.12	R
3	Zappone	Perrotti	1-86	6,943 s.f.	\$18,000	\$2.59	R
4	DiDonato	LeBlanc	1-86	5,000 s.f.	\$23,500	\$4.70	R
5	Sestilli	Palladino	1-86	4,500 s.f.	\$21,000	\$4.60	R
6	Domizio	Compt	2-86	10,800 s.f.	\$29,000	\$2.69	R
7	Dicostanza	Fusco	3-84	40,000 s.f.	\$100,000	\$2.50	CA
8	Glendale	Gettler	7-84	28,000 s.f.	\$60,000	\$2.14	CA
9	Inzero	Matthews	9-84	30,000 s.f.	\$55,000	\$1.83	CA
10	RLN Inc.	Bussias	9-85	68,743 s.f.	\$175,000	\$2.54	CA
11	Colucci	Duby	1-86	5,130 s.f.	\$6,500	\$1.26	CA

October 22, 1986

Planning Division  
Plan Formulation Branch

Mr. Stanley J. Pac, Commissioner  
Department of Environmental Protection  
165 Capital Avenue  
Hartford, Connecticut 06106

Dear Mr. Pac:

I have reviewed your August 20, 1986, comments to the draft Detailed Project Report (DPR) on the flood damage reduction plan for the Woodtick section of Waterbury, Connecticut. This is in response to the issues your department has raised and to clarify the report's findings.

Consideration was given to your recommendation of a narrower low flow channel and placing a small weir at the upstream openings of the Frost Road bridge box culverts. Engineering analyses of these designs shows that modifications to the low flow channel recommended in our DPR are possible. Although we cannot meet all the specifications of your proposal, we can incorporate a modified design that would be mutually beneficial to both environmental concerns and flood control interests. However, the plantings of "woody" vegetation within the channel area, as proposed in your letter, would jeopardize the hydraulic capacity of the flood control channel. In order to provide vegetation as you have proposed and maintain the same flow capacity, the channel cross section area would have to be substantially enlarged with a corresponding increase in real estate taking and major increases in maintenance costs over the life of the project. Grasses could be planted within the channel area without significant adverse effect on the flow. We will coordinate a modified low flow channel design with your office during the preparation of plans and specifications.

I concur with your recommendation that plantings be placed on the channel's bank to provide cover to minimize the increase of water temperature that would be caused by the channel widening activities. The Corps will recommend that plantings of appropriate and high value shrubs and trees be placed along the bank.

With regard to effects of increased development in the upstream watershed on the flow downstream, the project does not involve dikes or other impounding structures that would be subject to failure if design flows are exceeded. The proposed flood control project is mainly a channel improvement plan at two localized reaches. This type of plan continues to provide flood stage reduction even if future flows are greater than pre-project conditions. The proposed measures are very localized in nature and overall capacity is dependent in part on upstream and downstream unmodified reaches. Therefore, there would be little to be gained by making the improved reaches appreciably larger in capacity than adjacent unimproved sections.

Another concern in your letter was the anticipated expenditures for real estate. The correct figure estimated in the DPR for land acquisition is \$204,400. Table 6 of the DPR will reflect this figure consistent with the Real estate Appendix. The estimated values contained within the DPR are preliminary and used for project planning purposes only. All sales data used in conjunction with the Real Estate estimate, are based on availability of comparable sales in as close a proximity as possible to the project area. The final estimate will be updated and made current based on existing market conditions during preparation of plans and specifications. The final Real Estate costs will be based on the results of "Before" and "After" appraisals.

Knowing of your interest in the project, I will be sending you a copy of the draft Local Cooperation Agreement between the Department of the Army and the city of Waterbury within the next few days. The draft agreement will be used to negotiate local sponsorship obligations prior to the preparation of plans and specifications.

I hope that this letter answers your concerns. The Corps looks forward to working with personnel from your department on a modified solution to the low flow channel. If you have any further questions, please contact me at (617) 647-8508. Mr. Robert Russo is the Project Manager for this study and can be reached at (617) 647-8547.

Sincerely,

Joseph L. Ignazio  
Chief, Planning Division

cc:  
Mr. Jackson  
Reading File  
Plan Div Files





**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Habitat Conservation Branch  
Sandy Hook Marine Laboratory  
Highlands, New Jersey 07732

AUG 19 1986

Mr. Robert Russo  
U.S. Army Corps of Engineers  
New England Division  
NEDPL-PF, Bldg. 114-N  
424 Trapelo Road  
Waltham, Massachusetts 02254-9149

Dear Mr. Russo:

The National Marine Fisheries Service (NMFS) has reviewed the draft copy of the Mad River Detailed Project Report and Environmental Assessment which accompanied your letter of June 30, 1986. The document contains a plan to reduce the risk and severity of future flood losses in the Wood-tick area of Waterbury, Connecticut.

We have reviewed the information provided and have determined that the project will not affect resources or species for which the NMFS is responsible. Thank you for the opportunity to comment. Should you wish to discuss this matter further, please contact Michael Ludwig at our facility at 212 Rogers Avenue, Milford, Connecticut, 06460.

Sincerely,

  
Stanley W. Gorski  
Assistant Branch Chief



JOHN G. ROWLAND  
1st DISTRICT, CONNECTICUT

WASHINGTON OFFICE  
512 CANNON HOUSE OFFICE BUILDING  
PHONE (202) 225-3822

DISTRICT OFFICE:  
135 GRAND STREET  
WATERBURY, CT 06701  
(203) 573-1418

42 MAIN STREET  
DANBURY, CT 06810  
(203) 743-3364



Congress of the United States  
House of Representatives  
Washington, DC 20515

August 18, 1986

COMMITTEE ON PUBLIC WORKS  
AND TRANSPORTATION

SUBCOMMITTEE ON  
INVESTIGATIONS AND OVERSIGHT  
SUBCOMMITTEE ON SURFACE  
TRANSPORTATION

COMMITTEE ON VETERANS' AFFAIRS  
SUBCOMMITTEE ON HOSPITALS AND HEALTH CARE  
SUBCOMMITTEE ON HOUSING AND MEMORIAL AFFAIRS

SELECT COMMITTEE ON NARCOTICS  
ABUSE AND CONTROL

Mr. Robert Russo  
Project Manager  
Department of the Army  
Corp of Engineers  
424 Trapelo Rd.  
Waltham, Mass. 02254

Re: Mad River-Woodtick Area  
Flood Protection Project

Dear Mr. Russo,

I am writing on behalf of my constituent Mr. Tony Mascia of Waterbury, regarding the above referenced project.

Mr. Mascia is concerned that the Detailed Project Report, in its present form, does not adequately solve the flooding problem near his home at 809 Woodtick Rd. It is his contention that the first stage of the project should be extended to include the Preston Dr. area of Woodtick Rd. Mr. Mascia has more thoroughly explained this problem in a July, 1986 letter to the Army Corp. I would request that a review of his proposals be made so that the final project report can sufficiently provide for the entire area.

Please notify me of any action taken regarding this matter through my Waterbury district office.

Thank you for your consideration.

Sincerely,

John G. Rowland  
Member of Congress

JGR/mm

September 10, 1986

Planning Division  
Plan Formulation Branch

Honorable John G. Rowland  
House of Representatives  
Washington, DC 20515

Dear Mr. Rowland:

In the temporary absence of Colonel Rhee, I am responding to your letter of August 18, 1986, regarding concerns of your constituent, Mr. Anthony Mascia, about the Corps proposed local flood protection project, on the Mad River in the Woodtick section of Waterbury, Connecticut.

Mr. Mascia contacted the Corps of Engineers by letter dated August 1, 1986 to request that the proposed project limits on the Mad River be extended upstream along his property. Through our field investigations, it was found that there were two major river channel constrictions causing flooding in the Woodtick area. The localized channel widening plan project limits was selected because it maximized net economic benefits, while protecting the environment. Further channel widening activities upstream of the current project limits would disturb fish habitat and require the removal of most of the riparian vegetation that exists along this reach of the Mad River. The proposed project would reduce flood stages from a 100-year (1 percent chance) flood event by 1-1/2 feet, resulting in a 64 percent reduction in annual flood losses. Mr. Mascia and his neighbors would be direct beneficiaries of the proposed project. We will respond directly to Mr. Mascia to further explain our reasoning on selecting the project limits.

I hope this information addresses your concerns and that of your constituents. If you have any further questions, please contact me at (617) 647-8222. Mr. Robert Russo is the Project Manager for this study and can be reached at (617) 647-8347.

cc:

Mr. Jackson  
Exec. Office  
PAO  
Reading File  
Plan Div Files  
BAKX-CWZ-E

Sincerely,

Stanley J. Murphy  
Major, Corps of Engineers  
Acting Division Engineer

Copies Furnished:

Honorable John G. Rowland  
Representative in Congress  
135 Grand Street  
Waterbury, Connecticut 06701

Mr. Anthony Mascia  
809 Woodtick Road  
Waterbury, Connecticut 06705



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

**REGION I**

**J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203**

August 7, 1986

Mr. Robert Russo  
U.S. Army Corps of Engineers - NED  
NEDPL-PF, Bldg. 114-N  
424 Trapelo Road  
Waltham, Massachusetts 02254-9149

Dear Mr. Russo:

The draft copy of the Detailed Project Report and Environmental Assessment for the proposed Mad River Flood Protection Project has been reviewed by the Environmental Protection Agency. It was found that the project will have several adverse impacts that are of concern to us.

The report stated that approximately 1.35 acres of wetlands would be destroyed for the channel modifications, however, it did not mention how many acres of wetlands would remain after the project was completed. This value is necessary to determine if there will be sufficient wetlands left after the project has been completed to provide habitat for the birds and mammals that presently use the area. In addition, without this value, it is impossible to determine the extent that access to the river by wildlife will be impaired.

The proposed project will also adversely affect the fish habitat in the Mad River. This river, although it has already been degraded by silt deposits and channelization in the area of Royal Crest Estates still supports a substantial fishery, including white suckers, blacknose dace, minnows and wild brook trout. These species have been disturbed in the past and further disturbance should be avoided if possible. This project would result in the destruction of most of the vegetation overhanging the river as well as removal of many of the meanders and straightening of the shoreline. These measures will change the entire ecology of the river and will adversely affect the fish species presently there.

In addition to effects on the fishery, the project will also have an adverse impact on the habitat for birds and mammals. According to the U.S. Fish and Wildlife Service, the vegetation that remains

is limited in area, but is high quality, pristine land that provides excellent wildlife habitat. Much of this pristine land would be destroyed by river channelization.

Another possible impact that is barely touched upon in the report is the probability that this project will increase downstream flooding. It was mentioned that there are similar flooding problems in the vicinity of Century Brass Corporation downstream from the project area. The proposed channelization may result in increasing these problems, thus forcing further channelization and flood control measures.

Based on these adverse impacts, alternate methods that are less environmentally damaging should be analyzed. To start with, there should be stricter land use regulations that forbid further development in the floodplain. The filling that is still taking place adjacent to the river along Sharon Road should be stopped as soon as possible. In addition, some combination of land treatment, flood proofing, flood insurance and relocation could be used to minimize the damages caused by flooding.

If there are still unavoidable impacts to the fish and wildlife habitat, a mitigation plan that would compensate for these impacts should be developed in advance.

If you would like to discuss these comments, please contact Pam Shields of my staff at FTS 835-3543.

Sincerely,



Larry Brill  
Chief, Planning and Standards Section

October 3, 1986

Planning Division  
Plan Formulation Branch

Mr. Larry Brill  
Chief, Planning and Standards Section  
U.S. Environmental Protection Agency  
Region I  
J.F. Kennedy Federal Bldg.  
Boston, Massachusetts 02203

Dear Mr. Brill:

This is in response to your comments of August 7, 1986, concerning the draft copy of the Detailed Project Report (DPR) and Environmental Assessment (EA) for the proposed flood protection project along the Mad River in the Woodruff area of Waterbury, Connecticut.

With regard to your first comment, the Draft EA indicated that 1.3 acres of mixed upland and northern overflow forest habitat would be impacted by the project. Within the project's two reaches, between Sharon and Frost Roads, approximately one-half of the 1.3 acres can be classified as "wetland." The remainder is upland shrub-scrub and grassy habitat. Since the project area conservatively contains a total of about 1.6 acres of "wetland" habitat, about 1.0 acre of wetland would remain after the project is completed.

In your letter you suggested that the proposed project will change the entire ecology of the river and will adversely affect the fish species in the area. We do not anticipate that the project will have a significant impact to the river ecosystem. The combined length of both project reaches is about 1,270 linear feet which represents about 2 percent of the total 11 mile river length. The larger percentage of more valued stream habitat is upstream of the project and would not be affected by this project. Strict zoning and limited utilities along the upstream reaches of the Mad River would probably restrict development of the floodplain in the future. To partially offset the loss of habitat within the project reaches, several engineering measures are proposed. The low-flow channel (shown in Plate 5 in the DPR) would facilitate fish passage during low flow periods. Also, proposed instream boulders and channel riprap would provide some cover/substrate for fish and invertebrate forage. Plantings of appropriate and high value shrub and trees along the bank will be recommended. These plantings will provide food, cover and nesting habitat for wildlife as well as provide some shading for the river.

Your letter also suggested that the proposed project would have an adverse impact on increasing downstream flooding. The hydrologic analysis completed for the DPR revealed that the reduction in flood stages afforded by the channel widening does not have major effects on flood plain limits. Therefore, the effect on flood plain storage is also minimal. As a result, the proposed project would have no measurable effect on peak flood flows downstream of the project limits.

Finally, I can assure you that all possible alternatives to reduce flood damage losses have been examined. The Federal objective of this study is to contribute to national economic development consistent with protecting the Nation's environment. As a result a range of alternative plans were considered to reduce flood damages in the Woodtick area. The DPR (Page 13) discusses the alternatives examined. All of the nonstructural alternatives you have recommended in your letter have been investigated to determine their feasibility. None of these alternatives were found to be physically viable or cost effective. Hence, it is the opinion of the Corps that the benefits of the proposed local flood protection project to the community outweigh the generally minor environmental impacts of the project implementation and there is a demonstrable need for flood control in the project area.

I hope that I have answered all of your concerns with regards to the proposed project. If you have further questions, please contact me at (617) 647-8508. Mr. Robert Russo is the Project Manager for this study and can be reached at (617) 647-8547.

Sincerely,

Joseph L. Ignazio  
Chief, Planning Division

cc:  
Mr. Jackson  
Reading File  
Plan Div Files

Dear Mr Russo;

8/1/86

I am writing to you about our problems we're having with the Mad River on my property after we get a lot of rain or a big storm. We've been here for 20 years. When we first moved here the river had plenty of room to flow because there were no mills or apartments on or near my property. Now they built high above my land across the river & on the left side of my land they ~~built~~ built 10 feet above me. After some heavy rains the river rises very fast and I get flooded before anyone else after my land. There is a big bend before my land and the river is very narrow. The problem is that if you start widening the river about 75 feet before my land & bank my property we shouldn't have any more flooding in my area. I spent over 6000 on fill, but since they did all the developments I got



flooded over 4 times in the past 10 years. In 1983 & 1984 the river went into my house & I got over 3 feet of water in my basement apt. This flooding ruined my wall & fence & my driveway is all undermined & cracking and I lost my sheds with all the equipment & supplies. I lost 2 swimming pools one in 1983 & another in 1984. I am pleading with the Army Corps of Engineers to start the work about 75 feet before my property instead of Bufford Ave. The house before me & my house are always hit first during a flood. We lost quite a bit of money fixing up our property & live in fear when it rains a lot. Please consider my plea & come back & reconsider your case. When you come I'll show you the problem areas.

Thank You  
Sincerely

Anthony Mascia  
809 Woodtick Rd  
Waterbury Ct 06705-  
Tel No 203-574-1695

September 23, 1986

Planning Division  
Plan Formulation Branch

Mr. Anthony Mascia  
809 Woodtick Road  
Waterbury, Connecticut 06705

Dear Mr. Mascia:

This is in response to your letter of August 1, 1986, in which you requested that the proposed channel widening, along the Mad River in the Woodtick area of Waterbury, be extended upstream beyond the proposed project limits.

Extending the project upstream of Bouffard Avenue, as you request, would increase construction and real estate costs by more than \$700,000 and yield a much lower benefit-to-cost relationship than the Corps proposed project. Our hydraulic engineers and economists have reviewed your suggestion and have determined that flood reduction benefits would not increase significantly in proportion to the construction cost increase.

When project costs exceed derived benefits, the Corps of Engineers cannot participate in the project construction. If the channel project was extended up to your property, it is likely that the Corps of Engineers would not build any project along the Mad River because of this economic test. Although the proposed project will not eliminate all flood damages in the future, it will reduce them by more than 60 percent in the Woodtick area.

I can appreciate your concerns and can assure you that you and your neighbors will receive direct benefits from a reduction in flood damages associated the Corps proposed project. I hope that this letter answers your concerns and explains the Corps rationale in selecting a flood damage reduction plan. If you have any further question, contact me at (617) 647-8508. Mr. Robert Russo is the Project Manager for this study and can be reached at (617) 647-8547. Knowing of his interest in this matter, I am forwarding a copy of this letter to Congressman John G. Rowland.

cc:

Mr. Jackson  
Reading File  
Plan Div Files

Sincerely,

Joseph L. Ignazio  
Chief, Planning Division

Copies Furnished:

Honorable John G. Rowland  
House of Representatives  
Washington, DC 20515

Honorable John G. Rowland  
Representative in Congress  
135 Grand Street, Room 210  
Waterbury, Connecticut 06701

# Royal Crest Estates

SHARON ROAD • WATERBURY, CONNECTICUT 06705 (203) 755-0000

August 1, 1986

Mr. Robert Russo  
U.S. Army Corps of Engineers-NED  
NEDPL-PF  
424 Trapelo Road  
Waltham, Mass. 02254-9149

Dear Mr. Russo:

We have reviewed the Detailed Project Report for Flood Control in The Mad River Woodtick Area at Waterbury, Ct. We encourage the use of the plan selected by the corps and hope that work on the project will soon begin. We will also encourage the State of Connecticut and the City of Waterbury to adopt this plan based upon details in the corps study.

Our situation will only worsen if a flood reduction plan is not adopted and implemented at the earliest possible time.

Thanking you for your continuing involvement with this project.

Most Sincerely,

The Flatley Company

*Paul R. Robitaille*

Paul R. Robitaille  
Property Mgr.

CC:file



DESIGNED, BUILT AND MANAGED NATURALLY BY

BRAINTREE, MASSACHUSETTS

Office of the  
STATE  
HISTORIC  
PRESERVATION  
OFFICER

for Connecticut

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59 SOUTH PROSPECT STREET • HARTFORD, CONNECTICUT 06106 • 203 566-3005

July 9, 1986

Mr. Robert Russo  
U.S. Army Corps of Engineers - NED  
NEDPL-PF, Bldg. 114-N  
424 Trapelo Road  
Waltham, MA 02254-9149

SUBJECT: Draft -- Detailed Project Report-Environmental  
Assessment  
Mad River  
Woodtick Area  
Waterbury, CT

Dear Mr. Russo:


The State Historic Preservation Office has reviewed the above-named project. In the opinion of the State Historic Preservation Office, this project will have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

This office appreciates the opportunity to have reviewed and commented upon this project.

We recommend that the responsible agency provide concerned citizens with the opportunity to review and comment upon this project in accordance with the National Historic Preservation Act of 1966.

For further information, please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,



Dawn Maddox  
Deputy State Historic  
Preservation Officer

DAP:nlw



Part 1,

July 7-1986

Dear Sir

I want to thank you for  
the report on Local flood  
protection on the Mad  
River Woodtick area  
in Waterbury Conn. I live  
on Harpers Ferry Road  
in 1955 we had a big  
flood and in June 5-1982  
we had another bad one.  
I live on a street that  
the mad river runs right  
by my house. I lost four  
furnace and four hot water  
heaters. I just hope that  
Harpers Ferry Road is in

the plans for the flood<sup>pt 2</sup>.

Of the Mad River Woodtick  
area Waterbury Conn. 06705

The River also cost one  
of my neighbor three houses  
down the street. It cost  
him 10,000 dollars to restore  
in basement which he had  
made a kitchen downstairs  
and lost everything. He has  
six feet water in his cellar.

So you see we need  
help bad to. Thank you  
again for your draft.

Mr Mario Rucchi  
107 Maple Ferry Rd  
Waterbury, Conn.  
06705

August 26, 1986

Planning Division  
Plan Formulation Branch

Mr. Mario Aureli  
107 Harper's Ferry Road  
Waterbury, Connecticut 06705

Dear Mr. Aureli:

This is in response to your letter of July 7, 1986, in which you questioned if the Corps' proposed project on the Mad River in the Woodtick section of Waterbury protects your home from flood damages. The proposed project is localized in nature and will not reduce flood losses in the vicinity of Harper's Ferry Road, since the downstream channel clearing limit is just downstream from the Frost Road bridge, or about 1-3/4 miles upstream of Harper's Ferry Road.

Our investigations disclosed that, although flood damages occurred in the Harper's Ferry Road area during the June 1982 flood, the majority of flood losses were sustained upstream, in the river reach between Frost Road and Sharon Road. Engineering studies indicated that future flood losses could be reduced if flow restrictions were removed from the river in this reach. The study determined that limited channel enlargement, in lieu of a major channel modification would be environmentally acceptable and would not increase downstream flood levels during future flood periods. Because, there was insufficient economic justification for channel improvements near Harper's Ferry Road, this area was not included in the proposed flood protection project.

Although our proposed project will not reduce flood losses to your property, we understand that the city of Waterbury proposes to reconstruct the Plank Road bridge. Included in this project is the city's plan to widen the Mad River, near Harper's Ferry Road, in a similar manner to our proposed project. This plan should result in lowered flood stages in this area. You may wish to contact the City Engineer's office as he should have additional information on the bridge reconstruction and channel widening project.

I regret that I cannot be of greater assistance in providing a solution to your flood problem. However, I hope the foregoing information will be useful to you. If you have any further questions, please call me at (617) 647-8508. Mr. Robert Russo is the project manager and may be reached at (617) 647-8547.

cc:  
Mr. Jackson  
Reading File  
Plan Div Files

Sincerely,

Joseph L. Ignazio  
Chief, Planning Division

Office of the  
**STATE  
HISTORIC  
PRESERVATION  
OFFICER**  
*for Connecticut*

---

59 SOUTH PROSPECT STREET • HARTFORD, CONNECTICUT 06106 • 203 566-3005

November 22, 1985

Mr. Joseph L. Ignazio  
Chief, Planning Division  
Department of the Army  
New England Division, Corps of Engineers  
424 Trapelo Road  
Waltham, MA 02254

SUBJECT: Mad River, Waterbury, CT

Dear Mr. Ignazio:

The State Historic Preservation Office has reviewed the above-named project. In the opinion of the State Historic Preservation Office, this project will have no effect on historical, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

This office appreciates the opportunity to have reviewed and commented upon this project.

For further information, please contact David A. Poirier, Archaeologist.

Sincerely,



Dawn Maddox  
Deputy State Historic  
Preservation Officer

DAP/PW

Rev. 4/85





# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES  
P.O. BOX 1518  
CONCORD, NEW HAMPSHIRE 03301

NOV 15 1985

Mr. Joseph L. Ignazio  
Chief, Planning Division  
U.S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254

Dear Mr. Ignazio:

This responds to your October 24, 1985 request for information on the presence of Federally listed and proposed endangered or threatened species in conjunction with the proposed Section 205 Local Flood Protection Project, located on the Mad River in Waterbury, Connecticut.

Our review shows that except for occasional transient individuals, no Federally listed or proposed species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further consultation is required with us under Section 7 of the Endangered Species Act. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to endangered species under our jurisdiction. It does not address other legislation or our concerns under the Fish and Wildlife Coordination Act.

A list of Federally designated endangered and threatened species in Connecticut is enclosed for your information. Thank you for your cooperation and please contact us if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett  
Supervisor  
New England Area

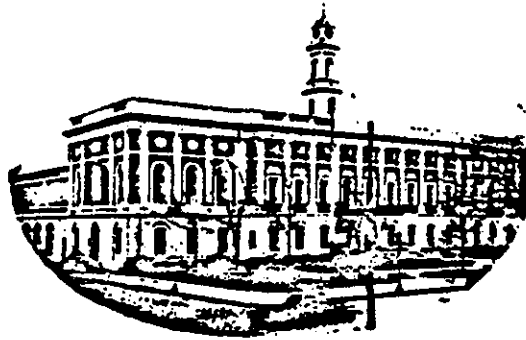
Enclosure

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES  
IN CONNECTICUT

Common Name	Scientific Name	Status	Distribution
<u>FISHES:</u>			
Sturgeon, shortnose*	<u>Acipenser brevirostrum</u>	E	Connecticut River and Atlantic Coastal waters
<u>REPTILES:</u>			
Turtle, green*	<u>Chelonia mydas</u>	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	<u>Eretmochelys imbricata</u>	E	Oceanic straggler in Southern New England
Turtle, leatherback*	<u>Dermochelys coriacea</u>	E	Oceanic summer resident
Turtle, loggerhead*	<u>Caretta caretta</u>	T	Oceanic summer resident
Turtle, Atlantic ridley*	<u>Lepidochelys kempii</u>	E	Oceanic summer resident
<u>BIRDS:</u>			
Eagle, bald	<u>Haliaeetus leucocephalus</u>	E	Entire state
Falcon, American peregrine	<u>Falco peregrinus anatum</u>	E	Entire state - re-establishment to former breeding range in progress
Falcon, Arctic peregrine	<u>Falco peregrinus tundrius</u>	E	Entire state Migratory no nesting
<u>MAMMALS:</u>			
Cougar, eastern	<u>Felis concolor cougar</u>	E	Entire state - may be extinct
Whale, blue*	<u>Balaenoptera musculus</u>	E	Oceanic
Whale, finback*	<u>Balaenoptera physalus</u>	E	Oceanic
Whale, humpback*	<u>Megaptera novaeangliae</u>	E	Oceanic
Whale, right*	<u>Eubalaena</u> spp. (all species)	E	Oceanic
Whale, sei*	<u>Balaenoptera borealis</u>	E	Oceanic
Whale, sperm*	<u>Physeter catodon</u>	E	Oceanic
<u>MOLLUSKS:</u>			
NONE			
<u>PLANTS:</u>			
Small Whorled Pogonia	<u>Isotria medeoloides</u>	E	Hartford, New Haven, Fairfield, New London, Windham, Tolland, Litchfield Counties

\* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service

EDWARD D. BERGIN  
MAYOR



THOMAS F. GAHAN  
EXECUTIVE AIDE

JOSEPH R. CARRAH  
ADMINISTRATIVE AIDE

**CITY OF WATERBURY**  
CONNECTICUT

October 20, 1983

Colonel Carl Sciple  
Division Engineer  
Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254

Re: LOCAL FLOOD PROTECTION  
CENTURY BRASS, FLEISHER FINISHING  
AND THE WOODTICK ROAD AREA

Dear Sirs:

After reviewing the preliminary plans submitted to this office by your office, The City of Waterbury is notifying you with this letter of our commitment to providing protection to the areas in question.

We would request that your office continue the study through design for Flood Protection for the areas in question.

Very truly yours,

THE CITY OF WATERBURY

  
Edward D. Bergin  
MAYOR

EDB:iam

**We're  on Waterbury!**

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## United States Senate

COMMITTEE ON BANKING, HOUSING, AND  
URBAN AFFAIRS

WASHINGTON, D.C. 20510

June 1, 1983

Colonel Max B. Scheider  
Division Engineer  
U.S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Mass. 02254

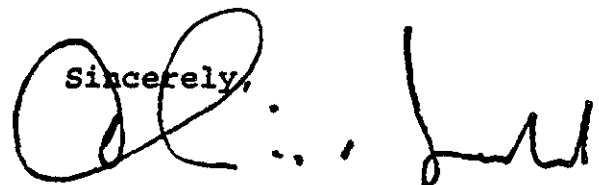
Dear Col. Scheider:

I am writing to you in behalf of my constituents, Christine & Armand Pronovost, and their interest in encouraging the implementation of flood management alternatives in the Mad River area adjacent to the Town of Wolcott and the City of Waterbury, Connecticut.

As you can see from the enclosure, my constituents are interested in obtaining a detailed study of possible corrective measures which could alleviate future flooding and protect the property of area residents. In addition, they are interested in obtaining federal government funding to reduce the current level of flooding. I would appreciate you investigating their request and providing me with a response at your earliest convenience.

Thank you, in advance, for your cooperation.

Sincerely,



CHRISTOPHER J. DODD  
United States Senator

enclosures  
in reply: 60 Washington St.  
Hartford, CT. 06106

1383 1111 -4 PM 4:35

89 Bouffard Avenue  
Waterbury, Ct. 06705

May 2, 1983

Congressman William Ratchford  
5th Congressional District  
135 Grand Street  
Waterbury, Connecticut 06702

Dear Congressman Ratchford:

As requested by your office I am documenting the problems of the Mad River Area as I have seen them develop over the past 35½ years. I have been a resident of Waterbury since 1928 and have occupied a dwelling at 89 Bouffard Avenue since 1948. My house is situated approximately 225' upslope from the river.

- 1948 - 1955 Normal Spring overflow of Mad River banks -- of short duration and causing no flooding of homes or clean-up problems.
- 1955 Flooding of basement and water damage to items stored in basement areas -- water receded quickly and there were no silt problems although the Flood Insurance Study made by the U. S. Dept. of Housing Development reported the August storm as worst of this Century.
- 1955 - 1978 Normal Spring and Fall overflow of the river banks. Quality of water changed in the river during the mid-1960's. Silting up of the river caused by development of Lakewood Road, Windy Drive and Ferrone Drive and mining along Mad River just over the Wolcott Line. Fish kills caused several times by discharges from factories in Wolcott below Scovill's Dam, and oil spills in river. River can no longer be used for swimming in Waterbury. By 1978 silt began to damage lawns.
- 1979 - Jan. and Mar. Sudden increase of flooding to levels of 1955 after far less rainfall than in '55. Silt levels increased, sanitary sewers backed up in cellars, etc.
- 1982 - June Water level exceeded 1955 level by 3' after approximately 4" less rainfall than in 1955, necessitating the use of pumps for the first time since we've lived here. Silt increased in riverbed to point where sandbars were left on lawns when water receded.

2, 1983

Page 2.

.1983 cont.)

During March and April flooding and silt problems have occurred almost on a weekly basis after 2 or 3 inches of rain.

#### Major Changes in Area - 1955 to 1979

Naugatuck Valley Mall	}	All of these border edge of river
Apartments between Lund Avenue and Orchard Lane		
Royal Crest Apartments		
Apartments at corner of Woodtick and Frost Roads		
" " " " Enoch St. and Meriden Road)		
South side of Woodtick Road heavily developed		
Factories built on Sharon Road		
Both sides of Lakewood Road and Wolcott St. developed		
Sharon Road, Woodtick Road, Stillson Road and Frost Road, Wolcott St. and Lakewood Road rebuilt		
New bridges at Frost Road and Sharon Road		
Factories built in Wolcott		
City dump moved to Lakewood Area		

#### Changes 1979 to Present

Apartments and Condos built at Sharon and Woodtick Roads  
Addition to factory on Sharon Road

#### Problems Caused by Flooding Since 1979

Sanitary sewers are backing up into basements  
Riverbed is being filled with silt  
Health - Physical from sanitary sewers back-up and the necessity to hurriedly move possessions such as heavy appliances, to a safe level if possible.  
Mental from panic over threat of physical dangers especially to elderly and handicapped and worry that costly repairs may be required -- in 1982 furnaces were damaged as well as rugs, furniture, bedding, etc. at first floor level.  
Evacuation - people who live at Royal Crest and the apartments at corner of Sharon and Woodtick Roads, and those between Orchard Lane and Lund Avenue have been evacuated.  
Access - Emergency vehicles access is limited at Royal Crest when entrance from street is flooded. Access across Sharon Road is limited when flooding over the bridge occurs.

The above observations indicate that the present level of flooding is a result of the following:

1. Increase in impermeable areas (buildings, parking lots) in both Waterbury and Wolcott.

(Present level of flooding cont.)

2. Filling of the river channel (silting and encroachment)
3. Filling of the floodplain
4. Filling and draining of wet lands
5. Silting up of the river channel by inadequate maintenance of storm sewer systems; i.e. catch basin cleaning, street cleaning, etc.
6. Silting up of the river and surrounding lands due to inadequate erosion control in areas draining into the Mad River
7. Construction of new storm sewers without detention basins in the area.

The above problems would not exist if proper standard land use practices were enforced by both Waterbury and Wolcott officials. The unwillingness or inability to cooperate to enforce Local, State and Federal regulations add to these problems.

As a result of increased annual flooding the values of the properties in the area are decreasing and unsuspecting people have bought property only to move out after the first flood. As the floodings increase the City and Town will be asked to reduce assessments. What will happen when the factories start getting flooded? Sears already has a silting problem caused by a stream coming down from Lakewood Road.

We know that it is desirable to increase the tax base but if the present practices are allowed to continue property values and tax revenues will drop. For example: At Royal Crest most everyone has a car, and the people living there have no school age children. What will happen if they continue to be flooded out? Who will occupy the empty apartments? These apartments are one of Waterbury's biggest assets.

As we see it the problem is twofold:

1. Prevent increased flooding of the river due to the continuing increase in runoff.
2. Protection of the properties presently being flooded.

Solutions for the first problem are relatively inexpensive and usually prove to be cost effective for the affected municipalities by not decreasing property values in the area. A partial list of the time-tested measures to limit flooding to present levels are listed as follows:

## (Solutions cont.)

- a. Protect existing wetlands within the drainage basin by not allowing any filling, draining or other activity within the wetlands: i.e. adhere to existing regulations.
- b. Allow no additional filling of the flood plain designated by the Flood Insurance Program.
- c. Require storm water retention basins and/or ground water recharge devices on all new developments, storm sewer systems, parking lots and other activity which will increase the peak flow in the watershed.
- d. Good house cleaning measures - i.e. cleaning of streets and catch basins on a regular basis to help retard further silting in of the riverbed.
- e. Adherence to accepted and proven erosion control measures to prevent further silting in of the river bed.

All of the above described measures are standard procedures followed by responsible local governments throughout the State. We suggest that both municipalities involved not only adopt these policies (many are presently part of their regulations) but also enforce them.

The second problem is much more costly and difficult to correct. A partial list of corrective measures is as follows:

1. Widen the existing riverbed.
2. Increase the flood plain volume by removing fill from the recognized flood plain.
3. Construct a flood control dam within the drainage basin.
4. Construct dikes and storm water pumping stations to protect properties adjacent to the river.
5. Purchase the properties within the flood plain.

A detailed study is required to determine which of the above, or combination of, will protect the properties presently being flooded. These solutions are usually funded by the State and Federal Government under the supervision of the U.S. Army Corps of Engineers, the Connecticut D.E.P. Water Resources Unit and the Soil Conservation Service.

In summary we strongly urge both the Town of Wolcott and the City of Waterbury perform their intended purpose of protecting the lives and properties of their citizens by implementing the measures outlined above to reduce flooding in the future. We also



May 2, 1983

Page 5.

(Summary cont.)

request the State and Federal Governments to provide the necessary funds to reduce the existing unacceptable flooding. There is no point in waiting until we have a catastrophe in the area and lives lost. So far we have been fortunate in that only property damage has occurred.

As I finish this letter, I find that further filling is going on at the corner of Preston Terrace and Woodtick Road.

Sincerely,

*Christine & Armand Pronovost*  
Christine & Armand Pronovost

Copies to: Christopher J. Dodd  
Lowell P. Weicker  
Stanley Pac  
Reese Morgan  
Edward Bergen  
William Swaine  
Thomas P. Brunnock  
Francis J. Sullivan  
Paul Vitarelli  
Thomas Stack  
William Sullivan  
Anthony Mirto  
Ernest Minervino

June 9, 1983

Planning Division  
Plan Formulation Branch

Honorable Christopher J. Dodd  
United States Senator  
60 Washington Street  
Hartford, Connecticut 06106

Dear Senator Dodd:

This is in response to your letter of June 1, 1983, concerning our current investigation of the flooding situation along the Mad River in Waterbury, Connecticut. You enclosed information provided by your constituents, Mr. and Mrs. Armand Pronovost of Waterbury.

The Pronovosts have provided an accurate assessment of the flooding situation as it pertains to the Woodtick section of Waterbury. Their observation that the flood problem is exacerbated by the rapid development of the watershed during the past decade and by the filling of flood plain lands is certainly an obvious conclusion and is shared by my staff engineers.

Notwithstanding the past developments that led to this serious situation, we have initiated a reconnaissance scope study to determine if there are any economically justified solutions to the problem that would be eligible for Corps of Engineers assistance. Engineers of my staff met with residents of the Woodtick area on April 20, 1983, to determine the extent of the flood problem. Concerned property owners have provided information relative to damages experienced during the record flood of June 1982 and again during this past spring.

Our current study, which is being performed under Section 205 of the 1948 Flood Control Act, will evaluate sustained flood losses and determine if these losses can be reduced by a plan of channel improvements or by nonstructural methods, such as evacuation of the flood plain or floodproofing of the buildings. I anticipate that our reconnaissance study can be completed within the next 60 to 90 days. I will provide a report of our findings to you at that time and will keep you informed of any other developments as they occur.

I hope the foregoing information will allow for a proper response to your constituents. Please do not hesitate to contact me at (617) 647-8220 if you have any further questions concerning our study.

Sincerely,

copy furnished:  
Hon. Christopher Dodd  
United States Senate  
Washington, DC 20510

DAEN-CWZ-D

Carl B. Sciple  
Colonel, Corps of Engineers  
Division Engineer

cc: Mr. Swaine, Reading File, Plan Div Files